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XXV. *A Review of the Ferns of Northern India.* By CHARLES BARON CLARKE,
M.A., F.L.S.

(Plates XLIX.-LXXXIV.)

Read June 19th, 1879.

INDIA proper (that is, exclusive of the Malayan or Trans-Gangetic Peninsula) was divided by Kurz into three main regions, viz. :—(1) the Himalaya, extending from Kashmir to Bhotan and Chittagong; (2) the Peninsula with Ceylon, extending as far north as the tableland extends; and (3) the great plain between, the home of the Hindoos, Hindoosthan.

The area included in the present paper comprises the first and third of these divisions, *i. e.* all India proper except the Peninsula. Several considerations have induced me to confine myself to this area. First, I have collected Ferns myself from Kashmir to Bhotan, Khasia, and Chittagong, for upwards of eleven years; I have only visited South India for a few weeks. Secondly, Col. Beddome has spent his Indian career in Southern India; and his account of the Ferns of Southern India is, in the judgment of Major Henderson, nearly unassailable; but Col. Beddome has, I believe, hardly collected at all himself in Northern India, and his invaluable plates of the Ferns of British India are, in the case of many species, founded on very scanty material. As my own Herbarium contains more forms from Northern India than the whole Kew accumulations, I hope therefore to have been able to add somewhat to the previous knowledge of the North-Indian Ferns.

I have drawn up the present paper at Kew, seated within a few yards of Mr. Baker; and I believe I have taken advantage of his extreme courtesy to the extent of asking his opinion on every point as it turned up. While, therefore, he is not responsible for the view I may have adopted in each case, I may claim that I have had the full benefit of his experience. After the different tribes have been written out, Major Henderson has gone over the whole material at Kew with me; he has corrected several slips that I had made; and in the body of the paper I have in all cases mentioned particularly any point wherein he differs from what I have written. The present paper is therefore virtually a paper by Major Henderson and myself; but, as I have done all the writing, he declined to have it so entitled.

The paper is in the form of a copious appendix to Hooker and Baker's '*Synopsis Filicum*;' *i. e.* I have often given no diagnosis of a species, and the remarks on every species are additions or corrections to the account in the '*Synopsis Filicum*.' No person is likely to undertake the study of Indian Ferns without this book at his elbow; and I have not wished to print more repetition than the large quantity always absolutely necessary in work of this kind. The first 48 pages of the '*Synopsis Filicum*' were done

given it by him who first referred it to the right genus; but Pteridologists follow the contrary rule, giving each Fern the specific name given it by him who first referred it to the wrong genus or to any genus. Mr. Bentham, in the 'Ferns of the Australian Flora,' has submitted to this distinction; it seems to me untenable. It is argued, indeed, that the species of Ferns have been arranged in genera in so many ways that less confusion on the whole arises by taking the oldest specific name; I think this is a very dangerous line of argument for any one to advance who follows the contrary rule with regard to Phænogams. I doubt whether the genera of Indian Ferns have been more changed than those of the Indian Rubiaceæ. However, as the present paper is founded on Hk. & Baker's Syn. Fil., I have, to avoid confusion, followed the rule adopted in that work, and have only changed Hk. & Baker's names where I have supposed myself compelled to do so in order to be consistent. I have quoted a large number of synonyms, which I believe a matter of great importance for the firm establishment of species; I have quoted none that I have not looked up and satisfied myself to mean the plant referred to: the only exceptions to this statement are references to Milde's *Equisetum*, Luerssen's *Ophioglossum*, and a few others of the same kind, in which cases botanists will at once understand that it would take weeks to master such elaborate monographs, and that I have not done so.

I have endeavoured to fix more accurately the habitat of the North-Indian Ferns. To read Hk. & Baker's Syn. Fil., or even Beddome's 'Supplement to the Ferns of India,' it would appear that the vast moist tropical plain of Bengal was nearly destitute of ferns. This, I need hardly say, is not so—several ferns attributed by authors to the "Himalaya" being abundant in Bengal, and several of them indeed, so far as my knowledge extends, being quite unknown in the Himalaya.

The Plates appended to the paper are entirely supplementary to those of Col. Beddome, and are not intended to be complete in themselves. Col. Beddome has so nearly exhausted the Ferns of India, that the Plates are merely designed to bring out minor differences to assist in specific determination: *e. g.* when a Plate is given of a fern scarcely specifically different from the universal *Pteris quadriaurita*, I have not given an analysis of the fruit to show that the genus is *Pteris*. So of the critical Athyriums, the Plates are designed merely to give an idea of the cutting, so difficult to define in words.

In the 'Supplement to the Ferns of India,' Col. Beddome allows (species and varieties with separate numbers)

In India	631 species.
In Southern India	320 „
In the Trans-Gangetic Peninsula	330 „
In Northern India	405 „

The present paper admits 363 species in Northern India, exclusive of 12 Lycopods and

<i>Hymenophyllum Levingii.</i>	<i>Nephrodium ingens</i> , W. S. Atkinson (compound <i>Lastrea</i>).
<i>Cheilanthes albomarginata.</i>	<i>Nephrodium Wightii</i> ,
<i>Pteris subindivisa.</i>	<i>Nephrodium multicaudatum</i> , } <i>Sagenia</i> .
<i>Asplenium belium</i> , Allantodioid.	<i>Polypodium subtripinnatum</i> (<i>Phegopteris</i>).
<i>Asplenium torrentium</i> ,	<i>Polypodium chattagramicum</i> (<i>Dictyopteris</i>).
<i>Asplenium sikkimense</i> ,	<i>Polypodium subamænum</i> (<i>Goniophlebium</i>).
<i>Asplenium succulentum</i> ,	<i>Polypodium jaintense</i> (<i>Niphobolus</i>).
<i>Nephrodium rhodolepis</i> (compound <i>Lastrea</i>).	<i>Polypodium clathratum</i> (<i>Pleopeltis</i>).

A considerable number of species (especially of Wallich's) that have been sunk or misunderstood are rehabilitated. More interesting than these or the new species are several cases where, by aid of the more abundant material at my command, I have altered the genus (or subgenus) to which the plant is referred : such are :—

<i>Hemitelia Brunoniana</i> ,	formerly <i>Alsophila Brunoniana</i> , Wall.
<i>Diacalpe fœniculacea</i> ,	„ <i>Aspidium fœniculaceum</i> , Hook.
<i>Davallia dareæformis</i> ,	„ <i>Polypodium dareæforme</i> , Hook.
<i>Lindsaya repens</i> ,	„ <i>Davallia repens</i> , Baker.
<i>A. (Euasplenium) longifolium</i> ,	„ <i>A. (Diplasium) longifolium</i> , Baker.
<i>A. (Pseudallantodia) procerum</i> ,	„ <i>A. (Athyrrium) umbrosum</i> , var., Baker.
<i>N. (Lastrea) sikkimense</i> ,	„ <i>Aspidium sikkimense</i> , Baker.
<i>P. (Pleopeltis) erythrocarpum</i> ,	„ <i>P. (Goniophlebium) erythrocarpum</i> , Baker.

Several of these species, placed in wrong genera or subgenera, have been hitherto insoluble mysteries to many Indian botanists who had collected the plants, but looked for them in the book under other genera or subgenera.

I have appended to the paper a complete reduction of the North-Indian Ferns in Wallich's Herbarium. This will be of some value to this Society in showing the state of that Herbarium, and may also assist botanists to form a correct estimate of the weight to be attached to the quotations of the Wallichian numbers. In very many cases a mixture of ferns is pasted down under one number; and in numerous cases the same fern appears under different numbers. The rule as to quoting Wallich's *names* is that the *name* applies to the plant on the large paper type-sheet (letter A). But this rule cannot be implicitly followed: the Wallichian no. 361 contained a large number of duplicate sheets; *all* these were one fern, *Aspidium fuscipes*, to which the specific name *fuscipes* has been applied; but I find that the type-sheet no. 361 is *Nephrodium sagenioides*, Baker, belonging to a different subgenus. About 3 per cent. of the Wallichian Ferns are blank sheets, on which are pasted the Wallichian lithographed ticket. I learn from Mr. West that these Ferns arrived loose, and that when they came to be pasted down it was in many cases found impossible to discover the plant belonging to the ticket; this seems to have been specially the case with the rarer and more critical species, of which probably only a small quantity was collected. The result of all these complications is that I begin to doubt whether the great pains taken in quoting Wallich's numbers are well bestowed; for I find, in very many instances, that such quotations have merely puzzled or misled. Mr. Moore has already pointed out that the *Asplenium Fin-*

laysonianum, Wall., of Hooker & Baker, is not *Asplenium Finlaysonianum*, Wall., nor even of the same subgenus, the fact being that the Wallichian duplicate sheets of *Asplenium Finlaysonianum*, Wall., at Kew, are not the same as the Wallichian type-sheet; and if errors from this cause are not rare at Kew, botanists at a greater distance from head quarters cannot be expected to avoid them.

Of the 379 species of North-Indian Ferns, 88 (so far as yet known) are confined to it. In the Himalaya westward from Nepaul 149 species occur, while in the Himalaya east of Nepaul 269 species occur; the Eastern region of Khasia and Chittagong has afforded 258, while 52 species occur in the plains. Out of 75 genera (as understood by Hooker and Baker) 50 are represented in North India.

1. GLEICHENIA, Smith.

1. *G. GLAUCA*, Hook. Sp. Fil. i. 4, t. 8 A, not of Swartz; Mett. in Ann. Mus. Lugd. Bat. i. 48. *G. longissima*, Blume, Enum. Pl. Jav. Fil. 250; Hook. Sp. Fil. i. 4; Mett. l. c.; Hk. & Baker, Syn. Fil. 12; Luerksen, Fl. Graeff. 248. *G. gigantea*, Wall. Cat. 157, as to the type-sheet; Hk. & Baker, Gen. Fil. t. 39; Hook. Sp. Fil. i. 5, t. 8 A; Bedd. Ferns Brit. Ind. t. 30. *G. Bancroftii* and *excelsa*, Hook. Sp. Fil. i. 5, t. 4 A, B. *G. arachnoides*, Mett. l. c. 47. *G. japonica*, Spreng. Syst. iv. 25. *Polypodium glaucum*, Thunb. Fl. Jap. 338. *Mertensia glauca*, Swartz, Syn. Fil. 164, 390. *M. glabra*, Brack. U.S. Explor. Ferns, 1854.

Sikkim and Bhotan; alt. 4500–7500 feet, in the dripping forest region, common. Khasia; alt. 3500–5000, common. Nepaul, Wallich.—Distrib. Extends eastwards through China, Japan, and Malaya, to Tropical Australia, Polynesia, and America. Not in the Deccan nor in Ceylon.

Scandent over other jungle, sometimes covering a spur for several hundred feet. Fronds in pairs at the dichotomous branching of the main rhachis, often 6 feet long, pendent, curved. Texture of the pinnules hard, stout, margin recurved; veinlets 2-branched from near their base. Frond (sometimes on both surfaces) with the capsules often glistening, puberulous, from scattered minute subglobose glands. Rhachis and pinnules beneath glaucous or densely ferrugino-tomentose (in the Indian examples).

2. *G. LINEARIS*, C. B. Clarke. *G. Hermannii*, R. Br. Prodr. 161, and in Wall. Cat. 155; Blume, Enum. Pl. Jav. Fil. 248, not of Hk. & Grev. *G. ferruginea*, Blume, Enum. Fil. Jav. 249; Hook. Sp. Fil. i. 10. *G. lanigera*, Don, Prodr. Fl. Nepal. 17. *G. dichotoma*, Hook. Sp. Fil. i. 12; Bedd. Ferns South Ind. t. 74; Mett. in Ann. Mus. Lugd. Bat. i. 50, t. 3; Carr. in Fl. Viti. 332; Hk. & Baker, Syn. Fil. 15; Benth. Fl. Austral. vii. 698; Luerksen, Fl. Graeff. 249. *G. Klotzschii*, Hk. Sp. Fil. i. 13, t. 5, B. *G. pteridifolia* and *crassifolia*, Presl, Epimel. 23, t. 13, 14. *Polypodium lineare*, Burm. Fl. Ind. 235, t. 67. fig. 2. *P. dichotomum*, Thunb. Fl. Jap. 338, t. 37; Roxb. in Calc. Journ. Nat. Hist. iv. 493. *Mertensia emarginata*, Brack. U.S. Explor. Ferns, 297, t. 42: *M. dichotoma*, Langsd. & Fisch. Voy. Russ. t. 29.

Sikkim, Bhotan, and Khasia, alt. 0–5000 feet, common; extending through Nepaul

to Kumaon, *Strachey & Winterbottom*.—Distrib. Mts. of Malabar and Ceylon, China, Japan, Malaya, to Tropical Australia, Polynesia, and America.

Scandent over other jungle, sometimes for several hundred feet, often rooting. Fronds in divaricate pairs. Texture of the pinnules hard, stout, margin recurved; veinlets 2- (or more) branched from near the base. Pinnules beneath usually glaucous, with some ferruginous hair near the base of the pinna; sometimes this hair extends to the rhachis of the pinnules beneath.

2. CYATHEA, Smith.

Involucre globose, uniform in texture, scarcely thinner at the apex, dehiscing by irregular lines when the capsules are ripe. At no stage of ripening, therefore, are the involucre to be found as hemispheres in which complete globes of unripe capsules are seated. (This definition is merely designed to separate the single North-Indian species from the closely allied *Hemitelia*.)

1. *C. SPINULOSA*, Wall. Cat. 178. Rhachis of pinnules beneath sparingly bullate-scaly, not pubescent; veinlets (in the segments of a pinnule from the middle of a barren pinna) 2-branched and frequently 3-branched; sori very large, the two rows occupying very nearly the whole breadth of the segment; involucre white, stout.—Hk. Sp. Fil. i. t. 12 c. (Pl. XLIX. fig. 1.)

Nepaul, *Wallich*; Jaintea Hills, alt. 4300–4500 feet, *C. B. Clarke*.

Attains 30 feet. Prickly, to the rhachis of the pinnules. Pinnules rusty, hirsute-pubescent on the midrib above, otherwise nearly glabrous. Fertile and barren fronds somewhat dimorphous; fertile segments much narrowed, especially in their fruit-bearing portion; the veinlets rarely 3-branched. The venation must be observed in the segments of the pinnules taken from the middle of a well-developed pinna from a barren frond. In many species of tree ferns with uniformly 2-branched veinlets, if an imperfectly-developed pinnule be taken from a pinna near the top of the frond, the veinlets may be found 3-branched or subpinnate. Sir W. J. Hooker took his figures from Wall. Cat. 178, which are very faithful; but fig. 4 (taken probably from a segment with very unripe fruit) shows the sori too small, and, indeed, does not agree with fig. 3 (same place), which shows the sori nearly as broad as the segment. The accompanying description (Sp. Fil. i. 25) is unfortunately drawn up partly from Wight's no. 149, which is *Alsophila latibrosa*; and the diagnosis in Hk. & Baker, Syn. Fil. 23, is similarly compounded of two plants. *Cyathea spinulosa*, Bedd. Ferns South Ind. t. 57, represents a pinna of *Hemitelia Beddomei*, *C. B. Clarke*, with analyses of segments copied from Hook. Sp. Fil. i. t. 12 c, which do not represent the Deccan species at all. *Hemitelia Beddomei* has the segments (of a pinnule from the middle of a well-developed pinna) elongate crenulate, veinlets frequently 3-branched, sori very small, involucre at first completely enclosing the sorus, but very thin and soon reduced to a hemispheric cup, and is not conspecific either with any Himalayan fern or any other than I can find in the Kew Herbarium.

3. *HEMITELIA*, R. Br.

Involucre at first globose, thin at the vertex, usually disappearing from the vertex before the capsules are ripe; the capsules then appear as a globose mass, half-exserted from a hemispheric cup having a slightly toothed margin. As the capsules ripen the cup withers or becomes less than a hemisphere, but is usually to be found as a patelliform scale (not as a more lateral bullate scale) completely surrounding the base of the sporophore after the capsules have fallen.

1. *H. decipiens*, J. Scott, in Trans. Linn. Soc. xxx. 33, t. 14. Rhachis of pinnules beneath bullate-scaly, not pubescent; veinlets (in the segments of a pinnule from the middle of a barren pinna) 2-branched and occasionally 3-branched; sori in two rows, rarely occupying the whole breadth of the segment; involucre membranous, at first globose, but reduced before the capsules are ripe to a hemispheric cup with an obscurely toothed margin.—Hk. & Baker, Syn. Fil. 455. *Alsophila decipiens*, Bedd. Ferns Brit. Ind. t. 311, not good. *Cyathea spinulosa*, J. Scott, l. c. 32, t. 13 A; Kurz, For. Fl. Brit. Burma, ii. 572, not of Wall. *Amphicosmia decipiens*, Bedd. Ferns Brit. Ind. Suppl. 1.

Sikkim; alt. 1000–4000 feet, frequent. Bhotan; Kalimpoong, alt. 4000 feet, C. B. Clarke. Khasia; below Nungklow, Griffith, Hk. f. & Thoms., and at the Bor Panee, Hk. f. & Thoms.

Attains 30–40 feet. Prickly, to the rhachis of the pinnules; pinnules glabrous or very nearly so; fertile segments narrowed in the fruit-bearing portion, or sometimes (in pinnæ from the same frond) not at all narrowed. This is specifically separated from *Cyathea spinulosa* by the much rarer 3-branched veinlets and the young fruit, excellently figured by J. Scott, l. c. t. 14. figs. 10, 11.

I have no hesitation, with J. Scott's descriptions, figures, and type specimens before me, in uniting *Cyathea spinulosa*, J. Scott, to *Hemitelia decipiens*; the two are, so far as I can see, absolutely identical. Whether *Cyathea spinulosa*, Wall., really differs specifically may be questioned: it seems to have been collected only thrice; and it would be hazardous to conclude that the white globes of fruit, uniformly tough throughout their whole extent, are more than a casual variety of the fruit of the much commoner *Hemitelia decipiens*.

2. *H. BRUNONIANA*, C. B. Clarke. Rhachis of pinnules beneath more or less crisped-pubescent; veinlets (in the segments of a pinnule from the middle of a barren pinna) 2-branched, none 3-branched; involucre membranous, at first (at least sometimes) globose, reduced before the capsules are ripe to a hemispheric cup or subpatelliform scale.—*Alsophila Brunoniana*, Wall.; Hook. Sp. Fil. i. 52. *A. latebrosa*, var. *hemitelioides*, J. Scott, in Trans. Linn. Soc. xxx. 34.

Sikkim and Bhotan; alt. 4000–7500 feet, very common. East Nepaul, Sir J. D. Hooker. Khasia; alt. 3000–5000 feet, very common.—Distrib. Deccan.

Usually 10–15 feet, attains 30–40 feet sometimes. Prickly, upwards muricated; rhachis

of pinnae often free from prickles; 3-branched veinlets very rare. In the common Khasi plant the involucre appears as a half-cup with lacerate margin while the spores are dispersing; in the Sikkim form the involucre, though a complete thin globe in the earliest stage, is reduced ultimately to a patelliform scale, sometimes hidden by the ripe sorus, but seen as a disk surrounding the carpophore when the spores have been dispersed. The whole of the Kew *Cyathea spinulosa* (except Wallich's type specimen) is this plant; it is very easily distinguished therefrom by the 2-branched veinlets and the pubescent rhachis of the pinnules. There is no original specimen of Wall. Cat. 3079—the examples under that number in the Wallichian Herbarium having been taken from the specimen on the staircase," which it was supposed might have been *A. Brunoniana*, Wall.: these are *Alsophila glauca*, J. Smith. The trunk referred to by Sir W. J. Hooker remains in the Kew Museum; but the fronds on it described by him are gone; this trunk, however, is certainly not that of *Alsophila glauca*, as supposed in Hk. & Baker, Syn. Fil. 42. Griffith says (Private Journals, p. 170), "the *Alsophila Brunoniana* is apparently confined to the limestone hill at Cherra, while the tree fern *Polypodium* is found on sandstone." The limestone hill at Cherra, alt. 4200 feet, still supplies plentifully *Hemitelia Brunoniana*. By the tree fern *Polypodium*, Griffith doubtless meant the exinvolucrate *Alsophila glauca*, which extends from the Cherra Khud to Sylhet Station. Griffith also says (Private Journals, p. 7) that Wallich and himself found *A. Brunoniana* during a trip from Cherra to Mamloo. The only tree ferns near this path are the *Hemitelia Brunoniana* across the brook on the limestone hill.

Var. ? *Scottii*. Segments of the fertile pinnules unusually large, deeply crenated, with many 3-branched veinlets.

Sikkim.—A single fertile pinna, collected by J. Scott, and marked by him *Alsophila latebrosa*, var. β , of which it has exactly the fruit. The 3-branched veins are a concomitant of the deeply crenate segments, which thus show an approach to a pinnatifid state. This is probably (as Scott evidently considered it) an unusually developed condition of the Sikkim form of *Hemitelia Brunoniana*; but I should not be surprised if it should prove a new species.

4. ALSOPHILA, R. Br.

Involucre, if any, disappearing before the capsules are mature. In several species there are ovate or ovate-lanceolate bullate scales along the rhachis of the pinnules and segments. When the sorus is near the midrib of the segment, the bullate scale may be attached by its broad base almost under the sorus, but only laterally to the sorus on the inner side, and not continuous with the carpophore; so that when the capsules have dispersed it does not appear as a patelliform scale surrounding the base of the carpophore. The bullate scale is of lax areolar tissue, entirely different from the thin scale which is the remnant of the involucre in *Hemitelia*, as J. Scott has remarked.

1. *A. LATEBROSA*, Hook. Sp. Fil. i. 37. Rhachis of pinnules beneath glabrous; veinlets (in the segments of a pinnule from the middle of a barren pinna) 2-branched; sori not nearly occupying the whole breadth of the segment.—Hk. & Baker, Syn. Fil. 43.

partly; Kurz, For. Fl. Brit. Burma, ii. 573. *Polypodium latebrosum*, Wall. Cat. 818, partly. *Hemitelia latebrosa*, Mett. in Ann. Mus. Lugd. Bat. i. 54?

Malabaria; Pinang; throughout Malaya common. No example from Northern India.

Var. ? *Schmidiana*, Kunze, in Linnæa, xxiv. 294. Rhachis of pinnules beneath crispedly pubescent.—*A. latebrosa*, Bedd. Ferns South. Ind. t. 58; J. Scott, in Trans. Linn. Soc. xxx. 34, t. 13 B. *A. khasiana*, Moore; Kuhn, in Linnæa, xxxvi. 154.

Sikkim; alt. 3500–5000 feet, *J. Scott*. Assam, *Mrs. Mack*.—These are the only examples in the Kew Herbarium. I have several times collected the plant both in Sikkim, Bhotan, and Khasia; but it is far less common than *Hemitelia Brunoniana*. This species is a fine green, drying a rich brown, in texture so unlike the black-drying shining Malay *A. latebrosa*, that I strongly suspect it to be a different species.

2. *A. GLAUCA*, J. Smith, in Hook. Journ. Bot. iii. 419. Frond glaucous beneath; veinlets (in the segments of a pinnule from the middle of a barren pinna) 2-branched, often 3-branched; base of the carpophore, after the capsules have fallen, naked or surrounded by lax hairs.—Mett. in Ann. Mus. Lugd. Bat. i. 54, with all syn. *A. contaminans*, Hook. Sp. Fil. i. 52, t. 18 B; Bedd. Ferns Brit. Ind. t. 85; J. Scott, in Trans. Linn. Soc. xxx. 35, t. 15; Hk. & Baker, Syn. Fil. 41; Kurz, For. Fl. Brit. Burma, ii. 573. *A. glaucescens*, Wall. Cat. 7074. *A. Wallichiana*, Presl; Hook. Sp. Fil. i. 55. *A. Brunoniana*, Bedd. Ferns Brit. Ind. t. 66, but not of Wall. *A. Sollyana*, Griff. Notul. i. ii. 624, Ic. Pl. As. Bar. 130, fig. 3. *Chnoophora glauca*, Blume, Enum. Pl. Jav. Fil. 443. *Polypodium contaminans*, Wall. Cat. 320.

Sikkim, Bhotan, Assam, Khasia, Cachar, Sylhet, Chittagong; alt. 0–4000 feet, frequent.—Distrib. Burma, Malay Peninsula and Islands.

Attains 50 feet (*J. Scott*). More or less prickly; fruiting segments more or less elongate; on the whole very uniform, and easily distinguishable from all other North-Indian Ferns. Neither of Beddome's pictures is good; he shows an apparently well-developed barren pinna without any 3-branched veinlets in the ultimate segments. *J. Scott's* picture is excellent.

3. *A. ORNATA*, J. Scott, in Trans. Linn. Soc. xxx. 36, t. 16 A. Pinnules glabrous beneath, or the rhachis slightly flocculose villous; fruit-segments linear-oblong, crenulate-serrate; veinlets (in the segments of a pinnule from the middle of a barren pinna) 2-branched, a few 3-branched; base of the carpophore, after the capsules have fallen, naked.—Bedd. Ferns Brit. Ind. t. 342; Hk. & Baker, Syn. Fil. 460.

Sikkim; alt. 2500 feet, Government Cinchona-plantation, *J. Scott*.

Collected by *J. Scott* twice apparently. Two fertile pinnæ at Kew, communicated by *J. Scott*. Otherwise unknown to me. Attains 20–40 feet, with a somewhat slender trunk. Seems to me more nearly allied to *A. latebrosa* than to *A. Oldhami*, but well distinct; the veinlets are much wider apart, sometimes 3-branched. Here, as in other species, there are no pinnate veinlets (as might be inferred from *J. Scott's* words); at the tips of the frond the segments, being imperfectly developed, become confluent; if the midrib

of the imperfect segment be taken for a veinlet, and its veinlets for branches, then a pinnate veinlet may be made out.

4. *A. ANDERSONI*, J. Scott, in Trans. Linn. Soc. xxx. 38, t. 17. Surface of the frond beneath with needle-like hairs; veinlets (in the segments of a pinnule from the middle of a barren pinna) 2-branched, none 3-branched; carophore hairy, without any involucre at its base after the capsules have fallen.—Bedd. Ferns Brit. Ind. t. 310; Hk. & Baker, Syn. Fil. 459.

Sikkim; alt. 1000–2500 feet, *J. Scott &c.* Khasia, *Dr. Jerdon*.

Attains 20–30 feet (*J. Scott*). Segments serrate; sori small, the two rows wider apart at the base of the segment than at the apex.

5. *A. OLDHAMI*, Bedd. Ferns Brit. India, t. 343. Pinnules glabrous beneath, often with ovate adpressed scales on the rhachis; veinlets not branched, or a few 2-branched; sori in two parallel rows, exinvolucrate.—*A. Scottiana*, Baker, in Gard. Chron. 1872, 699, with fig.; Hk. & Baker, Syn. Fl. 460. *A. comosa*, J. Scott, in Trans. Linn. Soc. xxx. 36, t. 16 B, not of Wall.

Sikkim; alt. 5000–6000 feet above the Cinchona-plantation, and above Khursiong. Khasia, *Dr. Oldham*, *Sir J. D. Hooker*; alt. 4000 feet, *C. B. Clarke*.—Distrib. Moulmein.

Grows in groves. Unarmed, trunks 6–10 feet. Ultimate segments oblong or narrow-oblong, strongly crenulate-serrate nearly to their base.

6. *A. GLABRA*, Hook. Sp. Fil. i. 51. Pinnules glabrous beneath, often with lanceolate or linear lax scales on the rhachis; veinlets not branched, or a few 2-branched; sori exinvolucrate, in two rows approximating towards the apex of the segment.—Bedd. Ferns South. Ind. t. 60; Hk. & Baker, Syn. Fil. 43; Mett. in Ann. Mus. Lugd. Bat. i. 52; J. Scott, in Trans. Linn. Soc. xxx. 38, t. 18; Kurz, For. Fl. Brit. Burma, ii. 573. *A. gigantea*, Hook. Sp. Fil. i. 53. *A. Helferiana*, Presl, Gefässb. 33. *A. Metteniana*, Hance, in Seem. Journ. Bot. 1868, 175. *Cyathea venulosa*, Wall. Cat. 180. *Gymnosphaera glabra*, Blume, Enum. Pl. Jav. Fil. 242. *Polypodium giganteum*, Wall. Cat. 321. *P. ? umbrosum*, Wall. Cat. 336. *P. altissimum*, Wall. MS.

From Nepaul to Assam and Chittagong; alt. 0–1000 feet, abundant, ascending to 4000 feet alt.—Distrib. Mts. of Malabar and Ceylon, Burma, the Malay Peninsula and Islands, South China.

Usually 10–20 feet, attaining 50 feet. The rhachis of the pinnule is usually glabrous beneath, sometimes with scattered very narrow scales or flocculose hairs of lax tissue, never (in the North-Indian examples) with needle-like hairs as shown in the enlarged fragment of a pinnule in Beddome's picture. The Assam example at Kew with needle-like hairs I take to be *Polypodium auriculatum*, Wall. Receptacle, after the capsules have fallen, glabrous, or more often minutely pubescent; not unfrequently with many lax hairs (paraphyses) in North-Indian examples.

54 DIACALPE, Blume.

1. *D. ASPIDIODES*, Blume, Enum. Pl. Jav. Fil. 241. Ultimate segments oblong, cuneate, nearly glabrous beneath, reddish or brown when dry.—Hk. & Bauer, Gen. Fil. t. 99; Hook. Sp. Fil. i. 59; Bedd. Ferns South. Ind. t. 257; Hk. & Baker, Syn. Fil. 45. *D. Hookeriana*, Moore, in Gard. Chron. 1854, 135. *Sphaeropteris Hookeriana*, Wall. Cat. 775. *Peranema aspidioides*, Mett.; Kuhn, in Ann. Mus. Lugd. Bat. iv. 285. *Aspidium foliolosum*, Wall. Cat. 359, partly by admixture.

Nepaul to Bhotan; alt. 6000–9000 feet, abundant. Khasia; alt. 4000–6000 feet, common.—Distrib. Ceylon, Moulmein, Tavoy, Malay Archipelago.

Very large and compound at its upper limit (9000 feet). Rhachis of pinna with blackish or chestnut linear scales or lax hairs. Involucre often splitting regularly by a clean dehiscence into two lips, in which state it cannot be separated from *Dicksonia*. This species so exactly resembles *Davallia nodosa*, Hook., that it has been repeatedly mixed with it by very competent botanists, from Wallich downwards. The pinnæ are often subopposite, with large ovate thin scales at their base; the venation is similar; and if the inchoate sorus (as Mettenius maintains) is not exactly similarly placed on the vein, it is very nearly so. *Davallia nodosa* may generally be distinguished (apart from the involucre character) by the much greater glabrousness of the rhachis of the pinna.

2. *D. FÆNICULACEA*, C. B. Clarke. Ultimate segments linear-acute, with few scattered long lax hairs beneath, glossy green when dry.—*Aspidium fœniculaceum*, Hook. Sp. Fil. iv. 36, t. 237; Hk. & Baker, Syn. Fil. 256. *Lastrea fœniculacea*, Bedd. Ferns Brit. Ind. t. 36.

Sikkim; alt. 7000–10,000 feet, east, west, and north, scattered, not common; but abundant at Buckeem, Upper Ratong, alt. 8000–9000 feet.

Stipes tufted. Closely allied to *D. aspidioides*. The involucre is leathery, dark purple, spherical, attached by the one point under its centre, not stalked, splits irregularly from above into 2–5 triangular segments.

6. ONOCLEA, Linn.

1. *O. ORIENTALIS*, Hook. Sp. Fil. iv. 161; Hk. & Baker, Syn. Fil. 46. *Struthiopteris orientalis*, Hook. 2nd Cent. Ferns, t. 4; Bedd. Ferns Brit. Ind. t. 171.

Sikkim; Lachen, alt. 12,000 feet, *Sir J. D. Hooker*; alt. 9000 feet, *H. J. Elwes*. Khasia (probably near Shillong), *Dr. Jerdon*. Assam (probably near Shillong or possibly the Gowhatty Teelas), *Simons*.—Distrib. Western China, Japan.

7. WOODSIA, R. Br.

1. *W. HYPERBOREA*, R. Br. in Trans. Linn. Soc. xi. 173, t. 11; Hk. & Bauer, Gen. Fil. t. 119; Hook. Sp. Fil. i. 64; Hook. Brit. Ferns, t. 7; Hk. & Baker, Syn. Fil. 46. *W. hyperborea*, R. Br. A. form 8. *subcordata*, Milde, Fil. Europ. 163. *Polypodium hyperboreum*, Engl. Bot. t. 2023.

Kashmir; Sind valley, alt. 8000 feet, *H. C. Levinge*, once collected.—Distrib. Alpine and Arctic Europe and North Asia.

Fronds 5 by $\frac{1}{2}$ – $\frac{3}{4}$ in.; lowest pinnæ $\frac{1}{2}$ in. distant. Pinnæ ovate and cordate-ovate, crenate with rounded lobes; needle-like hairs plentiful near the sori, few on other portions of the lower surface of the pinna. *H. C. Levinge*'s example is *W. hyperborea* type, in nowise verging towards *Woodsia lanosa*.

2. *W. LANOSA*, Hk. & Baker, Syn. Fil. 47; Bedd. Ferns Brit. Ind. t. 341. *W. mollissima*, Hook. MS.

Kumaon; Pindari alt. 12,000 feet, above Namik alt. 11,600 feet, *Strachey & Winterbottom*. Sikkim; Lachen, alt. 14,000–16,000 feet; Mt. Donkia, alt. 18,000 feet, *Sir J. D. Hooker*.

Like *W. hyperborea*, but the frond densely ferruginous, lanate beneath. The stipe is also villous or lanate in all the examples, though *Beddome* figures it glabrous; but the wool is deciduous, and seems likely to disappear altogether in age.

3. *W. ELONGATA*, Hook. Sp. Fil. i. 62, t. 21 c; Hk. & Baker, Syn. Fil. 47; Bedd. Ferns Brit. Ind. t. 14.

Himalaya; from Dhurmsala to Sikkim, alt. 8000–12,000 feet, frequent.

Frond 9 by 1–1 $\frac{1}{2}$ in., narrowly oblong; sori globose, much elevated; involucre thin but persistent, globose (though torn) in the over-ripe fronds.

8. PERANEMA, Don.

1. *P. CYATHEOIDES*, Don, Prodr. Fl. Nep. 12; Bedd. Ferns South. Ind. t. 73. *Sphaeropteris barbata*, Wall. Cat. 183, Pl. As. Rar. t. 48; Hk. & Bauer, Gen. Fil. t. 22; Hook. Sp. Fil. i. 58; Hk. & Baker, Syn. Fil. 49. *Cyathea barbata*, Wall. MS. *Aspidium spectabile*, Wall. Cat. 372, partly by admixture.

Nepaul and Bhotan; alt. 6000–10,000 feet, plentiful. Khasia; alt. 4500–6000 feet, plentiful.—Distrib. Western Ghats, *fide* Bedd. l. c. 25.

Main rhachis clothed with lanceolate-acuminate scales, and also laxly pubescent. *Aspidium spectabile*, Wall. Cat. 372, is *Lastrea pulvinulifera*, Bedd., mainly; but some *Peranema* has got mixed. The two (when without fruit) are difficult to separate; but *Aspidium spectabile* has the rhachis (exclusive of the scales) nearly glabrous.

9. DICKSONIA, L'Hérit.

1. *D. BAROMETZ*, Hk. & Baker, Syn. Fil. 49. *D. Baranetz*, Link, Fil. Sp. 166. *D. assamica*, Griff. Notul. i. ii. 607. *D. Griffithiana*, Griff. Ic. Pl. As. 136, fig. 2. *Cibotium Barometz*, J. Smith, in Hook. Lond. Journ. Bot. i. 437. *C. glaucescens*, Kunze, Hook. Sp. Fil. i. 82. *C. assamicum*, Hook. Sp. Fil. i. 83, t. 29 B. *C. glaucum*, Bedd. Ferns Brit. Ind. t. 83, not of Hook. & Arn. *Polypodium Barometz*, Linn. Sp. Pl. (ed. princeps) 1092.

Mishmee, *Griffith*. Assam, *Griffith*, *Mrs. Mack*, *Jenkins*.—Distrib. Tavoy, Malay Archipelago, South China.

Involucres large, persistent, almost or quite touching each other. The rhachises of the pinnules are arachnoid or paleaceous in the Assam examples, but not hirsute as *Griffith* has depicted.

2. *D. SCABRA*, Wall. Cat. 2173; Hook. Sp. Fil. i. 80, t. 27 B; Hk. & Baker, Syn. Fil. 54. *D. deltoidea*, Hook. Sp. Fil. i. 80, t. 27 A. *Dennstedtia deltoidea*, Bedd. Ferns South. Ind. t. 258.

Himalaya; from Kumaon to Bhotan, alt. 4000–8000 feet, common. Khasia; alt. 4000–6000 feet, common.—Distrib. Ceylon, Malay Peninsula.

Rhizome creeping, villous. Main rhachis scabrous, often wavy. Frond ovate or deltoid; pinnæ often distant; surface beneath with scattered glistening hairs. Very variable in size, and not, by that character, to be distinguished from *D. appendiculata*.—As to the synonym *Sitolobium strigosum*, J. Smith (adduced here in Hk. & Baker, Syn. Fil. 54), J. Smith says (Genera of Ferns, 102) that he meant thereby *Davallia strigosa*, Swartz; and in Historia Fil. 261, he refers the same species to *Microlepia*: many examples of *Dicksonia scabra* have been marked *Microlepia strigosa* in the Herbarium; but it does not appear clear that they were so marked by the hand of J. Smith.

3. *D. ELWESII*, Hk. & Baker, Syn. Fil. 54. *Patania Elwesii*, Bedd. Ferns, Suppl. t. 347.

Sikkim; Lachen, alt. 8500 feet, *H. J. Elwes*; Choongtam, alt. 9000 feet, *Sir J. D. Hooker*.

Glabrous, or the rhachis fibrillose. Frond large, lanceolate, elegantly cut. Ultimate segments oblong, entire, often somewhat clavate at the summit, which is entirely occupied by the sorus. Lower segments of the pinnule often divided; when barren, acute.

4. *D. APPENDICULATA*, Wall. Cat. 65; Hook. Sp. Fil. i. 79, t. 27 C; Bedd. Ferns Brit. Ind. t. 82; Hk. & Baker, Syn. Fil. 54.

North-west Himalaya; Kumaon, Gori valley, alt. 5500 feet, *Strachey & Winterbottom*; banks of Vishnugunga above Panchkisar, alt. 8000–9000 feet, *Edgeworth*. Nepaul, *Wallich*. Sikkim; Lachen valley, *Blanford & Elwes*; Sinchul, alt. 8500 feet, *N. Gamble*.

Rhachis of frond hairy. Frond oblong; pinnæ close together, their rhachises parallel. Surface of frond beneath with scattered hairs.

10. HYMENOPHYLLUM, Linn.

* *Margin of frond entire, neither serrulate nor ciliate.*

1. *H. EXSERTUM*, Wall. Cat. 170, as to the type sheet. Rhachis beneath with scattered lax rufous hairs.—Hook. Sp. Fil. 109, t. 38 A; Bedd. Ferns South. Ind. t. 9; Hk. & Baker, Syn. Fil. 58. *H. macroglossum*, v. d. Bosch, Hymen. Suppl. 72. *H. densum*, Wall. Cat. 171, as to fully half the type-sheet.

Himalaya; from Kumaon to Bhotan, alt. 4000–9000 feet, very common. Khasia; alt. 2000–5500 feet, common.—Distrib. Tenasserim, Mts. of South India and Ceylon.

Frond lanceolate, oblong, ovate, or short-triangular.—*H. ciliatum*, Swartz, differs by the margin of the frond being ciliate. Wallich's *H. exsertum* has some *H. polyanthos* mixed with it.

2. *H. POLYANTHOS*, Swartz, Syn. Fil. 149. Glabrous or very nearly so, frond not crisped, stipe without a wing, or with an exceedingly narrow wing.—Hk. & Grev. Ic. Fil. t. 128; Hook. Sp. Fil. i. 106; Bedd. Ferns South. Ind. t. 280, not t. 267; Hk. & Baker, Syn. Fil. 60. *H. polyanthos* β . *minor* (= *H. microsorum*, v. d. Bosch ex Benth. Suppl.), Bedd. Ferns Brit. Ind. t. 306. *H. abietinum*, Hk. & Grev. Ic. Fil. t. 128. *H. Blumeanum*, Spreng.; Blume, Enum. Pl. Jav. Fil. 220; v. d. Bosch, Hymen. Jav. 46, t. 36; Bedd. Ferns South. Ind. t. 266. *H. badium*, Wall. Cat. 172, not of Hk. & Grev. *H. microsorum*, v. d. Bosch, Hymen. Suppl. 71; Hk. & Baker, Syn. Fil. 59. *H. protrusum*, Hook. Sp. Fil. 104, t. 37 B. *H. pycnocarpum*, v. d. Bosch, Hymen. Jav. 48, t. 37. *H. integrum*, v. d. Bosch, Hymen. Jav. 49, t. 38. *H. sphaerocarpum*, *himalaianum*, *osmundioides*, v. d. Bosch, Hymen. Suppl. 83, 72, 80.

Himalaya; from Kumaon to Bhotan, alt. 1000–12,000 feet, abundant. Khasia; alt. 2000–6000 feet, very common.—Distrib. Mts. of Malabar and Ceylon, Burma. In nearly the whole world in tropical and subtropical moist regions.

Frond (in the Himalayan examples) varies from triangular to linear; involucre variable in size, often smaller than in v. d. Bosch's typical *H. microsorum*.—Only the species which v. d. Bosch has founded on North-Indian specimens are included in the above quotation of synonyms. None of these can be ranked even as a variety according to the scale adopted in the present paper. Not only may they all be collected in a short walk from Darjeeling, but a large number (I might say an indefinite number) of additional species (such as they are) will be collected during the same walk.

3. *H. JAVANICUM*, Spreng. Syst. iv. 132. Glabrous or very nearly so; frond more or less crisped, especially the wing of the main rhachis, which is carried down the stipe.—Blume, Enum. Pl. Jav. Fil. 222; Hook. Sp. Fil. i. 106; Hk. & Baker, Syn. Fil. 60; v. d. Bosch, Hymen. Jav. 50, t. 40; Benth. Fl. Austral. vii. 705. *H. serpens*, Wall. at. 173. *H. fimbriatum*, J. Smith; Hook. Sp. Fil. 102. t. 36 c; v. d. Bosch, Hymen. Jav. 55, t. 44. *H. flexuosum*, A. Cunningham; Hook. Sp. Fil. i. 105; Hook. Ic. Pl. t. 962. *H. crispatum*, Wall. Cat. 169; Hk. & Grev. Ic. Fil. t. 77; Hook. Sp. Fil. i. 105; Bedd. Ferns South. Ind. t. 207. *H. micranthum*, v. d. Bosch, Hymen. Jav. 52, t. 41. *H. erosum*, Blume, Enum. Pl. Jav. Fil. 221; Hook. Sp. Fil. i. 108; v. d. Bosch, Hymen. Jav. 54, t. 43. *H. dædaleum*, Blume, Enum. Pl. Jav. Fil. 222; Hook. Sp. Fil. i. 108. *H. Reinwardtii*, v. d. Bosch, Hymen. Jav. 52, t. 42.

Himalaya; from Nepaul to Bhotan, alt. 5000–8000 feet, common. Khasia; alt. 3500–5500 feet, common. Distrib. Mts. of Malabar and Ceylon; Burma, Malay Peninsula, Australia, New Zealand, Mauritius, and Bourbon.

Var. badium, (sp.) Hk. & Grev. Ic. Fil. t. 76. Frond hardly crisped.—Hook. Sp. Fil. i. 105; Bedd. Ferns Brit. Ind. t. 282; Hk. & Baker, Syn. Fil. i. 60, not of Wall.

The figure of Hk. & Grev. is taken from an example with large ultimate segments, and the stipe winged to the base, not the same as Wall. Cat. 172.

**** Margin of frond serrulate.**

4. *H. SIMONSIANUM*, Hook. 2nd Cent. Ferns t. 13. Stipe with few ferruginous hairs, frond pinnatifid to the winged rhachis; the primary segments 1-4-lobate; ultimate segments broadly oblong, serrulate, often 2 millims. broad.—Hk. & Baker, Syn. Fil. 68; Bedd. Ferns Brit. Ind. t. 281.

Khasia, *Dr. Simons*. Sikkim; alt. 4000-10,000 feet, common; extending from the plains to Kinchinjunga, and from East Nepaul to West Bhotan (and doubtless much more widely).

Stipe winged at the top or not. Frond 6 in., linear oblong, or round-ovate, 1½ in. in diam., and then full of fruit. Surface of the frond beneath usually glabrous; but ferruginous long hairs occur sometimes. Involucre subquadrate, often 2 millims. long. This fine species is at once recognized in Sikkim by its large size, broad segments, and large involucre.

5. *H. DENTICULATUM*, Swartz, Syn. Fil. 148 & 375. Frond slightly crisped, pinnatifid to the winged rhachis; primary segments pinnatifid; secondary segments oblong, sometimes again divided, serrulate on the margin, the serrulation often continued to the wing of the main rhachis; involucre ovate, with serrulate valves.—Hook. Sp. Fil. i. 101; Bedd. Ferns Brit. Ind. t. 278; v. d. Bosch, Hymen. Jav. 39, t. 29; Hk. & Baker, Syn. Fil. 71. *Trichomanes denticulatum*, Blume, Enum. Pl. Jav. Fil. 226.

Khasia; alt. 4000-5000 feet, frequent; plentiful in and round Cherra Station. Bhotan, among the Duphlas, *Col. Hutchinson*.—Distrib. Burma, Malay Peninsula and Islands.

Stipe usually with some fine scattered ferruginous hairs (even in the Malacca examples), rarely naked. Wing of the main rhachis usually produced to the base of the frond, and more or less upon the stipe. Frond varying from ovate to narrowly oblong, sometimes glabrous, sometimes with scattered hairs, especially on the main rhachis. Margin of the ultimate segments more or less acutely serrulate, generally through their whole outline. Involucres usually (in the Khasia examples) glabrous on their backs, sometimes scabrous, rarely with one or two hairs; the margin of the valves strongly serrulate, or often pectinate.

Var. flaccidum, sp., v. d. Bosch; Bedd. Ferns Brit. Ind. t. 276. Main rhachis often with much ferruginous hair beneath; frond flaccid, hardly at all crisped; ultimate segments slightly serrulate in their upper portion only, the main rhachis quite entire; valves of the involucre slightly serrulate at the summit. *H. khasianum*, Hk. & Baker, Syn. Fil. 464. (Pl. XLIX. fig. 2.)

Khasia; Cherra Station, growing with the type.

This var. may be related to *H. denticulatum* as *H. badium* is to *H. javanicum*, representing the fully developed uncrisped form of the plant. Every variation in denticulation and hairiness, and in serrulation of the involucre-valves, from *H. flaccidum* up to *H. denticulatum* may be seen in my copious examples. The fronds vary in shape from ovate to linear-oblong.—*H. Smithii*, Hook. Sp. Fil. i. 97, t. 35 B, slightly differs from *H. denticulatum*, var. *flaccidum*, by the ultimate segments being more narrowly oblong, the involucre-valves more elongate, less serrate, the carphophore frequently long exsert. It is a fern of the Malay Peninsula and Islands; and the Khasia example referred to it is typical *H. denticulatum*, var. *flaccidum*.—*H. ciliatum*, Swartz, is stated (Hk. & Baker, Syn. Fil. 63) to have been found in the East Himalaya, and by Beddome (Ferns Brit. Ind. t. 305) to come from Sikkim. There is no example of it at Kew from Northern India; nor have I ever seen an Indian specimen. Col. Beddome obtained his North-Indian Ferns second-hand; and many of the collectors mixed in their private collections ferns from all parts of the world. I am not sure that Col. Beddome's picture represents the true plant, which exhibits needle-like, stellate, sessile and stalked hairs, not there indicated (see Hk. & Grev. Ic. Fil. t. 35).

6. *H. LEVINGII*, C. B. Clarke. Frond small, narrowly oblong, not crisped, pinnatifid to the winged rhachis; primary segments 1-4-lobate; ultimate segments oblong, remotely serrate, their midrib with many hairs and lanceolar scales of the same texture as the frond. (Pl. XLIX. fig. 3.)

Sikkim; Yoksun and Neebay, alt. 7000 feet, C. B. Clarke.

Very delicate in texture. Stipe 1 in., with moniliform hairs. Frond 1-2 in. long, more or less covered with moniliform hairs. The lanceolar scales on the midrib beneath are attached by their whole base; they are sometimes rare, sometimes very numerous, so as to form a thick coat beneath the frond. Involucres usually 1-2 at the end of the segment, small, glabrous, subquadrate, valves separating nearly to the base, entire or slightly toothed at the apex; capsules of *Hymenophyllum* 2-4 to each involucre, carphophore included.—This is not much like any other species of the genus.

11. TRICHOMANES, Smith.

1. *T. MUSCOIDES*, Swartz, Syn. Fil. 141. Frond undivided, with a submarginal nerve.—Hk. & Grev. Ic. Fil. t. 179; Bedd. Ferns Brit. Ind. t. 304.

In the tropics of nearly the whole world and in Ceylon; not yet known from Northern India.

Var. *sublimbatum*, sp. C. Muell. in Bot. Zeit. 1854, 737. No trace of a submarginal nerve.—*Microgonium sublimbatum*, v. d. Bosch, Hymen. Jav. 6, t. 2.

Khasia, alt. 5000 feet; sandy rocks near Surureem, Griffith; once collected, Nov. 2, 1835, which day Wallich and Griffith halted in the Surureem (*i. e.* Sohra Reen) Bungalow and devoted to collecting.

Griffith's examples are very perfect; they agree altogether with the Java *T. sublim-*
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datum and not with the Ceylon plant (*Microgonium bimarginatum*, v. d. Bosch), which is a point in geographic distribution whether *T. sublimbatum* be estimated a species, or a var. as in Hk. & Baker, Syn. Fil. 75. Col. Beddome's figure, though given to illustrate the North-Indian plant, was not, it is presumed, drawn from a North-Indian example; it represents the Ceylon plant.

2. *T. KURZII*, Bedd. Ferns Brit. Ind. t. 286. Frond under 1 in. long, deeply pinnatifid; primary segments 1-3-lobate, ultimate segments linear.—*T. nanum*, Hk. & Baker, Syn. Fil. 77. *Crepidomanes nanum*, v. d. Bosch, Hymen. Suppl. 122.

Assam, Griffith.—Distrib. Andamans.

A note in the Kew Herbarium on this species runs:—"Very near *T. gracile*, v. d. Bosch, Hymen. Suppl. 23." There is no authentic example of *T. gracile* for comparison; but from the description it appears very near.

[*Trichomanes parvulum*, Poir. (Hk. & Baker, Syn. Fil. 75; Bedd. Ferns Brit. Ind. t. 179), is stated by Beddome, in Ferns Suppl. 3, to be a native of North India. There is no example at Kew thence.]

[*Trichomanes digitatum*, Swartz (Hk. & Baker, Syn. Fil. 76; *T. corticola*, Bedd. Ferns South. Ind. t. 264), is also stated by Beddome, in Ferns Suppl. 3, to be a native of North India. The scraps of Griffith were collected, in all probability, in the Malay Peninsula; and it is not known on what authority Col. Beddome locates the species in North India.]

3. *T. BIPUNCTATUM*, Poir. in Encyc. Méth. Bot. viii. 69. Frond tripinnatifid; lips of the involucre wider than the tube, ovate-acute or subacute.—Luerssen, Fil. Graeff. 241. *T. Filicula*, Bory, in Duperrey, Voy. Bot. i. 283; Hook. Sp. Fil. i. 124; Carr. in Fl. Viti. 344; Bedd. Ferns Brit. Ind. t. 283; Hk. & Baker, Syn. Fil. 81. *T. insigne*, Bedd. Ferns Brit. Ind. t. 284. *T. plicatum*, Bedd. Ferns Brit. Ind. t. 285. *Hymenophyllum Filicula*, Willd. Sp. Pl. v. 528. *H. densum*, Wall. Cat. 171, as to the top specimen on the type-sheet. *H. alatum*, Schkuhr, Fil. t. 135 b. *Didymoglossum Filicula*, v. d. Bosch, Hymen. Jav. 35, t. 26. *D. racemosum*, *late-alatum*, *plicatum*, *euphlebiun*, v. d. Bosch, Hymen. Suppl. 53, 54, 55, 58.

Himalaya; from Kumaon to Bhotan, alt. 1000-6000 feet, common. Khasia; alt. 2000-5000 feet, common.—Distrib. Malay Peninsula, and the tropics of the whole world.—The Malabar examples from Bombay to Ceylon are somewhat intermediate between the Himalayan *T. bipunctatum* and the Chittagong *T. pyxidiferum*, having the lips of the involucre as broad or broader than long, and rounded. The Himalayan type has the lips of the involucre ovate subacute, more so even than as shown in Beddome's plate. There is no good line between *T. bipunctatum* and *T. pyxidiferum*.

4. *T. PYXIDIFERUM*, Linn. Sp. Pl. 1561. Frond tripinnatifid; lips of the involucre wider than the tube, obtuse, broader than long, or sometimes almost truncate.—Hk. & Grev. Ic. Fil. t. 206; Hook. Sp. Fil. i. 124; Bedd. Ferns South. Ind. t. 7; Hk. & Baker, Syn. Fil. 81; Benth. Fl. Austral. vii. 703. *T. Schmidianum*, Zenk.; Taschner,

Trichom. 34, t. 1. fig. 1. *T. proliferum*, Thwaites, Enum. 397. no. 3329, not of Blume : see G. W. Cat. Ferns Ceylon, 1.

East Bengal ; from Cachar to Chittagong, alt. 0–1500 feet, common.—Distrib. Deccan and Malay Peninsulas, and tropical and warm temperate regions throughout the world.

There is no Himalayan example of this at Kew, except a scrap communicated by Levinge, named *T. pyxidiferum* (by Beddome, correctly), and said to be from Darjeeling ; but this has travelled through many hands, and the original collector does not appear.

Var. *limbatum*, Bedd. Ferns Brit. Ind. t. 348. Fronds up to 6–8 in. long ; pinnæ larger and less cut than in the type.

Khasia ; alt. 6000 feet, *Hk. f. & Th.*—Beddome says (doubtless correctly) that this is *T. limbatum*, Wall. ; but there is no example of Wallich's so named at Kew.

5. *T. RADICANS*, Swartz, Fl. Ind. Or. 1736. Frond 3–4-pinnatifid ; main rhachis naked, or winged sometimes to the base of the stipe ; ultimate segments oblong, 1-nerved ; lips of the involucre scarcely wider than the tube, often altogether truncate.—Hook. Sp. Fil. i. 125, with syn. ; Hook. Brit. Ferns, t. 42 ; Bedd. Ferns Brit. Ind. t. 181 ; Hk. & Baker, Syn. Fil. 81, not Hk. & Grev. Ic. Fil. t. 218. *T. umbrosum*, Wall. Cat. 165. *T. Kunzeanum*, Hook. Sp. Fil. i. 127, t. 39 d.

Himalaya ; from Nepaul to Bhotan, alt. 2000–7000 feet, common. Khasia ; alt. 2000–5500 feet.—Distrib. Mergui (not from the Deccan), and scattered throughout warm and warm-temperate regions of both hemispheres.

Often climbing trees to the height of 10 feet ; 1–2-pinnate, with finely divided fronds, and then very distinct from all other Indian ferns, but varies so as to be with difficulty separated from *T. pyxidiferum* on the one hand, *T. auriculatum* on the other.

Var. *anceps*, sp. ; Wall. Cat. 166. Frond smaller ; stipe often winged to the base ; primary segments pinnatifid, or somewhat 2-pinnatifid ; lips of the involucre slightly broader than the tube.

Sikkim and Khasia, frequent.—This is separated from *T. pyxidiferum*, var. *limbatum*, by the lips of the involucre being much shorter, and the stipe often winged to the base. Maximowicz has sent exactly the same plant from Japan marked *T. radicans*, Sw. ? Capt. Henderson is inclined to admit it to specific rank.

6. *T. AURICULATUM*, Blume, Enum. Pl. Jav. Fil. 225. Frond 1–2-pinnatifid, scarcely 3-pinnatifid ; main rhachis more or less winged ; ultimate segments ovate entire, with flabellate nerves, or narrowly oblong, 1-nerved ; lips of the involucre scarcely wider than the tube, often altogether truncate.—Hook. Sp. Fil. i. 133 ; Hk. & Baker, Syn. Fil. 82. *T. Belangeri*, Bory, in Bélanger, Voy. Bot. t. 8. fig. 1. *T. dissectum*, J. Smith ; Hook. Sp. Fil. i. 140 ; Bedd. Ferns Brit. Ind. t. 182. *Cephalomanes auriculatum*, v. d. Bosch, Hymen. Jav. 34, t. 25.

Sikkim and Bhotan ; alt. 2000–7000 feet, frequent. Khasia ; alt. 3000–5500 feet, common. Cachar, *R. L. Keenan*.—Distrib. Malaya to Japan, Guiana.

7. *T. JAVANICUM*, Blume, Enum. Pl. Jav. Fil. 224. Frond simply pinnate; pinnae oblong serrate or linear fimbriate.—Hk. & Grev. Ic. Fil. t. 240; Hook. Sp. Fil. i. 130; Hook. Garden Ferns, t. 37; Bedd. Ferns Brit. Ind. t. 180; Hk. & Baker, Syn. Fil. 83; Luerissen, Fil. Graeff. 242; Benth. Fl. Austral. vii. 702. *T. rigidum*, Wall. Cat. 161, not Swartz. *T. setigerum*, Wall. Cat. 158. *Cephalomanes javanicum*, Zollingeri, rhomboideum, v. d. Bosch, Hymen. Jav. tt. 22, 23, 24.

Cachar, R. L. Keenan. Chittagong; alt. 0–1000 feet, plentiful.—Distrib. Malay Peninsula and Islands to Australia and Polynesia, Madagascar.

12. DAVALLIA, Smith.

Sect. I. *Humata*. Rhizome long-creeping; stipes solitary, distant, articulated upon the rhizome; involucre thick, coriaceous, semicircular, attached by the base only.

1. *D. PEDATA*, Smith, Tentam. Gen. Fil. 15; Blume, Enum. Pl. Jav. Fil. 230; Wall. Cat. 250; Hook. Sp. Fil. i. 154, t. 45 A; Hook. Garden Ferns, t. 7; Hk. & Baker, Syn. Fil. 89; Benth. Fl. Austral. vii. 716. *D. subimbricata*, Blume, Enum. Pl. Jav. Fil. 231. *Adiantum repens*, Linn. f. Suppl. 446. *Humata pedata*, J. Smith; Bedd. Ferns South. Ind. t. 12.

Sikkim, Dr. Jerdon. Bhotan, Griffith. Khasia and Jaintea; alt. 4000 feet, generally scattered, not common.—Distrib. Malayan Peninsula and Islands, Ceylon, extending to North Australia, South China, and Japan, and to the Mascarene Islands.

Easily separable from all other North-Indian Ferns, but closely allied to several Malayan. Not distinct from *D. alpina*, Blume, in the judgment of Col. Beddome.

Sect. II. *Leucostegia*. Rhizome long-creeping; stipes solitary, distant, articulated upon the rhizome (except in *D. nodosa*); involucre thin, membranous, semicircular or ovate, attached by the base only.

2. *D. MEMBRANULOSA*, Wall. Cat. 255. Scales of the rhizome subulate from a narrow lanceolate base; main rhachis beneath laxly hairy.—Hook. Sp. Fil. i. 159, t. 53 A; Hk. & Baker, Syn. Fil. 91. *Leucostegia membranulosa*, Bedd. Ferns Brit. Ind. t. 98.

Nepaul, Wallich. Kumaon; Moharguri Pass, alt. 6500 feet, Strachey & Winterbottom.—Distrib. Yunan.

There are only these three pieces of this fern in the Kew Herbarium. It is very near *D. multidentata*, but differs in the points stated. The whole frond is more or less hairy

beneath. Wallich's example is glabrous above, even on the main rhachis. Sori and involucres small, and as in *D. multidentata*.

3. *D. MULTIDENTATA*, Hk. & Baker, Syn. Fil. 91. Scales of the rhizome ovate acute; main rhachis beneath glabrous or glandular subfoculose. *Acrophorus Thomsonii*, Moore, Ind. Fil. ii. 4. *Microlepta pteropus*, Bedd. Ferns Brit. Ind. t. 92. *Polypodium multidentatum*, Wall. Cat. 348.

Himalaya; from Nepaul to Bhotan, alt. 5000–8000 feet, frequent. Khasia; alt. 4000–5000 feet, frequent.

Rhizome usually stouter and frond larger than in *D. membranulosa*. Ovate scales often scattered about the rhachis, especially about the base of the pinnæ, as in *D. nodosa* and some other species. Rhachis of frond above pubescent. Frond often glandulose beneath, sometimes even to the involucres.

4. *D. ASSAMICA*, Hk. & Baker, Syn. Fil. 467. Scales of the rhizome ovate acute or acuminate; frond glabrous, glistening, subcoriaceous. *D. micans*, Mett. in Griff. no. 2790. *Acrophorus assamicus*, Bedd. Ferns Brit. Ind. t. 94.

Bhotan; Mishmee, and by the Dihong, Griffith.

There are four sheets of this, all from Griffith's collections, in the Kew Herbarium. In one example the scales of the rhizome are narrower, lanceolate acuminate. Involucre rather large, broader than long, much resembling that of *D. immersa*.

5. *D. IMMERSA*, Wall. Cat. 256. Frond glabrous; sori large, impressed, clearly visible from the upperside of the frond; involucres large, broader than long.—Hook. Sp. Fil. i. 156; Hook. Fil. Exot. t. 79; Hk. & Baker, Syn. Fil. 91. *Leucostegia immersa*, Hk. & Bauer, Gen. Fil. t. 52 A. *Acrophorus immersus*, Bedd. Ferns South Ind. t. 11.

Himalaya; from Mussoorie to Bhotan, alt. 3000–6000 feet; plentiful in Sikkim. Khasia; alt. 4000–5000 feet, common. Behar; Parasnath summit, alt. 4200 feet, Sir J. D. Hooker.—Distrib. Mts. of Malabar (rare). Malay Peninsula and Java (seems not common).

Rhizome much underground, and there without scales; the tips above ground with chestnut lanceolate-acute scales.

6. *D. DAREEFORMIS*, Levinge, MS. Scales near the ends of the rhizome spreading acuminate caudate from an ovate or lanceolate base; frond finely cut; ultimate segments narrow, not very acute; involucre fugacious; sorus finally large, often broader than its segment.—*D. Clarkii*, Hk. & Baker, Syn. Fil. 91. *Acrophorus Hookeri*, Moore, Ind. Fil. ii. 2; Bedd. Ferns Brit. Ind. t. 95. *Polypodium dareeforme*, Hook. Sp. Fil. iv. 256; Hook. 2nd Cent. Ferns, t. 24; Bedd. Ferns Brit. Ind. t. 174; Hk. & Baker, Syn. Fil. 339. *Gymnogrammitis*, Griff. Ic. Pl. As. t. 129. fig. 1.

Himalaya; from Nepaul to Bhotan, alt. 5000–11,500 feet, frequent. Khasia; alt. 4000–5500 feet, frequent.—Distrib. Moulmein.

This belongs to the section *Pseudocystopteris*. The involucre is sometimes across a vein, very often at the bifurcation of a vein, very rarely subterminal on a vein.

7. *D. PULCHRA*, Don, Prodr. Fl. Nep. 11. Scales of the rhizome adpressed, obtuse, often peltately attached; ultimate segments of the leaves small, lanceolate, not distant, often not very acute; involucre prominent; sorus usually about as broad as its segment.—*D. chærophylla*, Wall. Cat. 259; Hook. Sp. Fil. i. 157, t. 51 A; Hk. & Baker, Syn. Fil. 92. *Cystopteris squamata*, Dcne. in Jacquem. Voy. Bot. 178. *Acrophorus pulcher*, Bedd. Ferns South. Ind. t. 10.

Himalaya; from Nepaul to Bhotan, alt. 2000–9000 feet, abundant. Khasia; alt. 3000–6000 feet, common.—Distrib. Moulmein; Mts. of Malabar and Ceylon.

Belongs to sect. *Pseudocystopteris*, the involucre being often at the bifurcation of a vein. The venation, however, only very slightly tends to that of *Cystopteris*. The sori may be considered terminal on the veinlet, as they are slightly above the bifurcation. In the typical form the scales of the rhizome are closely sessile, attached by their middle, their whitened edges being imbricate when fresh, slightly recurved when dry.

- Var. *pseudo-cystopteris*, sp. Kunze, in Bot. Zeit. 1850, 68. Scales of the rhizome more spreading; ultimate segments often very acute.—*Acrophorus pseudo-cystopteris*, Bedd. Ferns Brit. Ind. t. 92. *Cystopteris dimidiata*, Dcne. in Jacquem. Voy. Bot. t. 178. (Pl. XLIX. fig. 4.)

Himalaya; from Dalhousie to Nepaul, alt. 4000–8000 feet.—This seems only a north-west var. of *D. pulchra*. Some of the examples of *D. pulchra* collected by Sir J. D. Hooker in North Sikkim at 11,000 feet alt. seem to run into the var. *D. pseudo-cystopteris*.

[Hk. & Baker, Syn. Fil. 92, give East Himalaya as a habitat for *D. affinis*, Hook.; but I have never seen that species from North India. The Himalayan examples so named in the Kew Herbarium are *D. pulchra*, Don, type. Mr. Baker further adds that *D. affinis* is probably a var. of *D. pulchra*; but Beddome (in Ferns South. Ind. t. 252) rightly remarks that the rhizome is very different. The two species appear to me clearly distinct; but they will not be so if Himalayan examples are called *D. affinis*.]

8. *D. NODOSA*, Hook. Sp. Fil. i. 157. Frond large, broad, compound, usually 4-pinnatifid; lower pinnæ often opposite or subopposite; ovate scales scattered on the rhachis, especially at the base of the pinnæ and pinnules; ultimate segments oblong or obovate-oblong, not acute.—Hook. Journ. Bot. 1857, t. 10; Hk. & Baker, Syn. Fil. 92. *D. stipellata*, Wall. Cat. 260. *D. ligulata*, Wall. Cat. 254. *Aspidium nodosum*, Blume, Enum. Pl. Jav. Fil. 171. *A. foliolosum*, Wall. Cat. 359. *Acrophorus nodosus*, Presl, Tent. Pterid. t. 3. fig. 2; Bedd. Ferns Brit. Ind. t. 93. *Cystopteris nodosa*, Mett. in Ann. Mus. Lugd. Bat. i. 241.

Himalaya; from Nepaul to Bhotan, alt. 3000–7000 feet; abundant in Sikkim. Khasia; alt. 3000–6000 feet, common.—Distrib. Malacca, Java.

Rhizome underground, shortly creeping, the summit with lax ovate not acute scales;

stipes clustered, not articulate. This fern does not resemble *Alsophila* except in the size of the fronds, which are not rarely 6 feet in diam. It so closely resembles *Diacalpe aspidioides* that, as to some fragments in over-ripe fruit, I am not sure whether they are *Diacalpe* or *Davallia nodosa*. An example with rather larger segments and sori than usual has been separated by Mr. Baker, and marked *D. sphæropteroides* provisionally, but is perhaps only meant to be a variety. Mettenius places this fern in *Cystopteris*, alleging that the sori in their evolution are not truly terminal on the vein. But if on that ground this fern is to be placed in *Cystopteris*, it will be better to unite *Cystopteris* and *Davallia*. The present fern is unlike all other *Leucostegias*, and by habit, as well as by the character of the rhizome, belongs rather to sect. *Microlepia*.

Sect. III. *Eudavallia*. Rhizome long-creeping; stipes solitary, distant, articulated upon the rhizome; involucre subcoriaceous, cylindric, attached by the sides as well as by the base.

9. *D. DIVARICATA*, Blume, Enum. Pl. Jav. Fil. 237. Scales of the rhizome long-lanceolate, caudate, chestnut-coloured; involucre as long as broad.—Hook. Sp. Fil. i. 167; Hk. & Baker, Syn. Fil. 96, not of Schldl. *D. polyantha*, Hook. Sp. Fil. i. 168, t. 59 A; Bedd. Ferns Brit. Ind. t. 107.

Sikkim, *W. S. Atkinson*. Mishmee and Khasia, *Griffith*. Seems very rare in North India.—Distrib. Malaya, South China.

10. *D. GRIFFITHIANA*, Hook. Sp. Fil. i. 168, t. 49 B. Scales of the rhizome long-lanceolate, caudate, white or yellowish; involucre broader than long.—Bedd. Ferns Brit. Ind. t. 106; Hk. & Baker, Syn. Fil. 96.

Bhotan and Mishmee, *Griffith*. Khasia and Jaintia; alt. 3000–5000 feet. *Griffith*, *Hk. f. & T.*, *C. B. Clarke*.—Distrib. South China. (Baker adds Malay Peninsula; but I do not find any examples thence at Kew.)

The involucre in this species are very shortly attached on the sides, and the species might be placed in the section *Leucostegia* (as in a field-note of Sir J. D. Hooker).

11. *D. BULLATA*, Wall. Cat. 258. Scales of the rhizome hair-pointed, from a lanceolate base, chestnut-coloured; involucre longer than broad.—Hook. Sp. Fil. i. 169, t. 50 B; Bedd. Ferns South. Ind. t. 17; Hk. & Baker, Syn. Fil. 97. *D. dimidiata*, Dcne. in Jacquem. Voy. Bot. t. 178.

Himalaya; from Nepaul to Bhotan, alt. 2000–6000 feet, common. Khasia; alt. 2000–5000 feet, common.—Distrib. Bombay Ghâts, Wynaad, Ceylon, Malay Peninsula and Islands, South China, Japan.

In all these *Davallias* the scales of the rhizome must be taken for examination from near the growing or stipe-bearing extremities. In *D. bullata* the scales on the older portions of the rhizome are sometimes ovate-obtuse, exceedingly like those of *D. pulchra*, Don.

Sect. IV. *Microlepia*. Rhizome very shortly creeping; stipes tufted, not articulated from the rhizome; involucre triangular or subsemicircular, not quite marginal.

12. *D. HOOKERIANA*, Wall. Cat. 2684. Pinnæ narrowly oblong, acuminate, entire or crenate-serrate, not pinnatifid; ultimate veinlets parallel.—Hook. Sp. Fil. i. 172, t. 47 B; Bedd. Ferns Brit. Ind. t. 101; Hk. & Baker, Syn. Fil. 97.

Sylhet, *Wallich*. Upper Assam, *Griffith*. Khasia, *F. Henderson*. Mikir Hills, *Simons*.—Distrib. South China.

Frond thinly hispid on both surfaces; pinnæ often auriculate at base on the upper margin, the rhachis beneath laxly villous, not closely strigose, subhirsute. Baker and Beddome give Kumaon as a locality for this species. There is no example thence (there are only four Indian examples altogether at Kew); it seems not probable that it was ever collected there. Wallich is not safe in the matter of localities, as he in several cases mixed Kumaon and Tenasserim collections together, sorted them by hand and eye, and distributed sheets compounded of Kumaon and Tenasserim species.

13. *D. PLATYPHYLLA*, Don, Prodr. Fl. Nep. 10. Large, glabrous, bipinnate, tripinnatifid; secondary pinnæ coriaceous, shining on both surfaces, lanceolate-linear, often caudate.—Hk. & Baker, Syn. Fil. 99. *D. lonchitidea*, Wall. Cat. 240; Hook. Sp. Fil. i. 173, t. 46 B; Hook. Fil. Exot. t. 19. *Microlepia platyphylla*, J. Smith; Bedd. Ferns South. Ind. t. 13.

Himalaya; from Nepaul to Bhotan, alt. 3000–5500 feet, plentiful in Sikkim. Khasia, alt. 3000–4000 feet.—Distrib. Mts. of Malabar and Ceylon.

Rhizome horizontal; the stipes approximate near its apex. Young frond with lax long hairs scattered often on both surfaces; fruiting frond and fully developed barren frond altogether glabrous.

There is a very fine new species, *D. Kurzii*, C. B. Clarke, obtained by Kurz in Burma, uniformly pubescent beneath, the ultimate segments triangular, subobtuse, with bluntish serratures, otherwise like *D. platyphylla*.

14. *D. UROPHYLLA*, Hook. Fil. Exot. t. 19, note. Large, bipinnate, tripinnatifid, secondary pinnæ coriaceous, shining above and beneath, but pubescent on the rhachises beneath, lanceolate-linear, very finely cordate.—Hk. & Baker, Syn. Fil. 99, not of Wall. Cat. 2683. *Microlepia caudigera*, Moore in Herb. Not *Microlepia urophylla*, Bedd. Ferns Brit. Ind. t. 103.

Bhotan, *Griffith*, nos. 1449, 2795; 4 sheets in the Kew Herbarium. (Pl. L.)

Closely allied to *D. platyphylla*. Ultimate segments lanceolate, secund, quite glabrous beneath.

15. *D. MARGINALIS*, Hk. & Baker, Syn. Fil. 98. Pinnæ narrowly oblong-linear, subentire, crenulate or pinnatifid halfway to the midrib, but not more deeply; rhachises beneath strigose, subhirsute; veinlets and involucre more or less villous.—*D. scabra*, Don, Prodr. Fl. Nep. 9. *D. villosa*, Wall. Cat. 244; Hook. Sp. Fil. i.

172, t. 48 A. *Microlepia scabra*, Bedd. Ferns Brit. Ind. t. 102. *M. urophylla*, Bedd. Ferns Brit. Ind. t. 103, not of Wall. *Polypodium marginale*, Thunb. Fl. Jap. 337.

Nepaul and Kumaon, *Wallich*. Khasia, *Griffith*. Mikir Hills, *Simons*. In the Kew Herbarium only 8 sheets from India.—Distrib. Formosa, Japan.

Pinnæ above shining, somewhat coriaceous; the midrib pubescent or hirsute; beneath the veinlets (in the dried example) are much raised, as in *D. polypodioides*, Don.—In the form of this species which has the pinnæ subentire the sori are wide apart and at some distance from the edge, the involucres hirsute; so that it is easily separated from *D. Hookeriana*, where the sori are in a quasi-continuous row very near the margin, the involucres glabrous. The present species is only separated here from *D. polypodioides*, Don, in that its pinnæ are pinnatifid not more than halfway down, while in the least-divided forms of *D. polypodioides*, Don, the pinnæ are divided very nearly, if not quite, to the midrib; *i. e.* the frond is called bipinnate.

Var. *calvescens*, (sp.) Hook. Sp. Fil. i. 172, t. 48 B. Pinnæ glabrous beneath, except the strigose hirsutulous midrib.—*Davallia urophylla*, Wall. Cat. 2683, not of Hook.

Kumaon, *Wallich*.—Wall. Cat. 2983, cited by Hook. *l. c.*, is not a fern. It is perhaps through some mixture of the numbers here that *D. urophylla* has been supposed to grow in Kumaon.

16. *D. POLYPODIOIDES*, Don, Prodr. Fl. Nep. 10. Frond bipinnate, sometimes tripinnate; rhachis of the pinnæ beneath strigose hirsutulous; veinlets of the ultimate segments raised beneath (in the dried examples).—Hook. Sp. Fil. i. 181, var. γ and part δ. *D. Khasiyana*, Hook. Sp. Fil. i. 173, tt. 47 A, 57 A. *D. hirta*, Kaulf.; Hook. Sp. Fil. i. 181; Hk. & Baker, Syn. Fil. 100. *D. strigosa*, Hk. & Baker, Syn. Fil. 80. *D. Roxburghii*, Wall. Cat. 2218. *D. rhomboidea*, Wall. Cat. 257. *D. pilosula*, Wall. Cat. 263. *D. proxima*, Blume, Enum. Pl. Jav. Fil. 238. *Dicksonia polypodioides*, Swartz, Syn. Fil. 356. *Trichomanes strigosum*, Thunb. Fl. Jap. 339. *Microlepia strigosa*, Moore; Bedd. Ferns South. Ind. t. 255. *M. hirta*, Bedd. Ferns Brit. Ind. t. 256.

Himalaya, from Kumaon eastwards; Khasia, Chittagong, abundant; most common at 5000–5000 feet alt.—Distrib. Malabar and Ceylon, Malay Peninsula and Islands, China, Japan, Polynesia, and Tropical America.

No Indian fern, in the opinion of W. S. Atkinson and Major F. Henderson, is more difficult to limit or to subdivide than this. There are no good breaks in the series from *D. scabra*, Don, to *D. flaccida*, R. Br. I here follow exactly Mr. Baker, but unite his *D. strigosa* and *hirta* into one species. They differ solely in the degree to which they are divided. This will depend largely (as W. S. Atkinson has shown) on the age of the rhizome; the same rhizome which in its early years produces 2-pinnate fronds will in full strength produce 3-pinnate. I have *D. flaccida*, R. Br. type once-pinnate scarcely twice-pinnate, the fronds being in scanty fruit as usual with such from weak rhizomes.

I separate *D. polypodioides*, Don, from *D. flaccida*, R. Br., by a combination of two

characters. *D. polypodioides*, Don, besides the raised veinlets giving the segments a stout plicate appearance, always has the rhachis of the pinnæ beneath strigose hirsutulous; i. e. the hairs are close together, straight, somewhat stiff, slanting forwards. Beddome's figures, above quoted, do not show these; but I presume he has got the true plant, and that the lax sparse villousness of the rhachis in his figures is the work of his native artist. As to the varieties, which graduate completely into each other, and which are exceedingly alike in texture, venation, and the nature of the indumentum, the following have been noted:—

- Var. 1. *strigosa*. Frond 2-pinnate, the secondary pinnæ not pinnatifid.—*D. strigosa*, var. α , Hk. & Baker, Syn. Fil. 93.
- Var. 2. *rhomboidea*. Frond 3-pinnate; ultimate segments in their outline subentire, lightly crenate. *D. rhomboidea*, Wall. Cat. 257.
- Var. 3. *pilosula*. Frond 3-pinnate; ultimate segments deeply notched, often more hirsute and some thin, straight, patent hairs added.—*D. pilosula*, Wall. Cat. 263.
- Var. 4. *hirta*. More hairy than var. 3.—Hook. & Baker, Syn. Fil. 100.

Besides the foregoing are the numerous forms of fronds from young rhizomes.—Benth. Fl. Austral. vii. 717, judging from his diagnosis, from his synonymy, and from the Australian material at Kew, has included under *Davallia speluncæ* the whole of the present *D. polypodioides*, Don, as well as *D. flaccida*, R. Br.; and I suspect that is the course which ultimately pteridologists will take.

17. *D. FLACCIDA*, R. Br. Prodr. 157. Frond usually 3-pinnate; rhachis of the pinnæ beneath with flaccid hairs, or sometimes very villose, but not strigose; ultimate segments thin, flat; the veinlets not raised beneath.—Don, Prodr. Fl. Nep. 10; Blume, Enum. Pl. Jav. Fil. 237, exl. syn. *D. pilosa*, Roxb. in Calc. Journ. Nat. Hist. iv. 515, t. 32. *D. puberula*, Wall. Cat. 262. *D. pyramidata*, Wall. Cat. 261. *D. speluncæ*, Hk. & Baker, Syn. Fil. 100; Luerssen, Fl. Graeff. 218; Benth. Fl. Austral. vii. 717. *D. jamaicensis* and *trichosticha*, Hook. Sp. Fil. i. 183. *Aspidium pilosulum*, Wall. Cat. 337, partly. *A. puberum*, Wall. Cat. 338. *Microlepia speluncæ*, Moore; Carr. in Fl. Viti. 340; Bedd. Ferns Brit. Ind. t. 353. *Polypodium speluncæ*, Linn. Sp. Pl. 1555?

From Kumaon to Upper Assam and Chittagong, alt. 0–4000 feet, common.—Distrib. Deccan Peninsula and Ceylon; Malay Peninsula and Islands; and in the Tropics nearly throughout the world.

Cyatheid, Griff. Ic. Pl. As. 131, i. fig. 1', 2', 3', 4', Notul. i. ii. 625, perhaps belongs here. As to 131, i. fig. 1, it appears from the Notul. l. c. not to be the same; it may be *Hypolepis*, and, if so, not North-Indian.

There are two Deccan and one Ceylon specimen of this at Kew; and Wall says it is common in Ceylon, though Beddome doubts whether it is a South-Indian fern. It must be very doubtful therefore whether it is the fern Linnæus described from Ceylon as *Polypodium speluncæ*. Fronds flaccid, usually large, sometimes 10 feet long. This fern

grows at low elevations, and is one of the few ferns that spread out a hundred miles from the hills over the plains of East Bengal, as mentioned by Roxburgh. It is thin in texture, with weak glandular pubescence, and often more or less villous also. Several varieties of this were distinguished by Wallich; but they run completely into one another.

Var. 1. *pubera*. Rhachis of the pinnæ slightly glandular-pubescent beneath, or nearly glabrous.—*Aspidium puberum*, Wall. Cat. 338.—The least-common variety.

Var. 2. *pilosula*. Rhachis of the pinnæ beneath with lax scattered hairs not straight.—*Aspidium pilosulum*, Wall. Cat. 337.

Var. 3. *pyramidata*. Rhachis of the pinnæ densely villous beneath.—Wall. Cat. 261. *Alsophila Grevilleana*, Wall. Cat. 7075.—This is the critical form; the ultimate segments are often very villous beneath; and this state is, I find, usually ticketed *D. hirta*; but the texture is thin, the veinlets not raised beneath, and the pubescence is not strigose.

I would not pretend to lay down the law concerning these difficult forms, concerning which Col. Beddome does not agree with Mr. Baker; but having collected this fern in numerous forms on many occasions, and having a large series, I am clear that *D. pyramidata*, Wall., runs into *D. flaccida*, R. Br., rather than into any form of *D. strigosa* or *hirta*, Baker. I communicated a very flaccid example of *D. flaccida* from young rhizomes sparsely in fruit to Col. Beddome, which he returned, saying he had no name for it. Another still weaker example (less divided) of mine I found in the *D. strigosa* Kew bundle. Both these were from young rhizomes among a bed of *D. flaccida typica*.

Sect. V. *Stenoloma*. Rhizome creeping; stipes tufted, not articulated upon the rhizome; involucre terminal on the segments, often uniting.

18. *D. CHINENSIS*, Swartz, Syn. Fil. 133; Roxb. in Calc. Journ. Nat. Hist. iv. 517; Langsd. & Fisch. Voy. Russ. t. 27; Hook. Sp. Fil. i. 187; Carr. in Fil. Viti. 338. *D. tenuifolia*, Swartz; Blume, Enum. Pl. Jav. Fil. 239; Wall. Cat. 245; Presl, Tentam. Pterid. t. 4. fig. 27; Hook. Sp. Fil. i. 186; Bedd. Ferns South. Ind. t. 16; Hk. & Baker, Syn. Fil. 102. *Trichomanes chinensis*, Linn. Sp. Pl. 1562. *Lindsaya chinensis*, Mett.; Luerssen, Fil. Graeff. 224.

Himalaya; from Kumaon to Bhotan, alt. 1000–4000 feet, plentiful. Khasia; alt. 1000–3000 feet, common.—Distrib. South India and Ceylon, Malaya, China, Japan, Polynesia, East-African Islands.

There is no good line here between *Davallia* and *Lindsaya*. Mett. Fil. Hort. Lips. 103 says that in *Davallia* the veinlets are carried free to the edge, while in *Lindsaya* they form a lodged marginal vein near the edge. In *D. tenuifolia* it is common to find confluent sori. Mettenius (*l. c.*) left the present species in *Microlepia*; but it exists in the Kew Herbarium marked "*Lindsaya tenuifolia*, Mett. !"; and I do not know why it is not a *Lindsaya*.

13. CYSTOPTERIS, Bernh.

1. *C. SETOSA*, Bedd. Ferns Brit. Ind. t. 312. *Lastrea setosa*, Bedd. Ferns Brit. Ind. t. 262. *Davallia setosa*, Hk. & Baker, Syn. Fil. 468.

Sikkim; alt. 5000–8000 feet, very common.—Distrib. Moulmein.

Tufted, the stipes rising from nearly one point. Frond 1–3 feet; both surfaces more or less scattered with white lax hairs, which consist of a single row of cells varying in size. Veinlets carried straight (often undivided) beneath the sorus to the margin of the leaf. The genus must be *Cystopteris* if that genus is retained. Mr. Baker has probably placed *C. setosa* in *Davallia* because of its large size. If the two genera are united, the place of *C. setosa* will not be in *Leucostegia* (where Mr. Baker has put it), but in *Microlepia* near *D. speluncæ*. The involucre in *C. setosa* is small, subquadrate, white, of lax tissue, attached by the base, and at a very early stage scarcely attached elsewhere—is in all respects that of *Cystopteris*. The involucre is usually directly across an undivided vein, not as in *D. pulchra*, var. *pseudo-cystopteris*.

2. *C. FRAGILIS*, Bernh. in Schrader, Neu. Journ. ii. 27, t. 2. fig. 9; Hk. & Bauer, Gen. Fil. t. 52 B; Hook. Sp. Fil. i. 197; Hook. Brit. Ferns, t. 23; Bedd. Ferns Brit. Ind. t. 91; Hk. & Baker, Syn. Fil. 103; Benth. Fl. Austral. vii. 752. *C. fragilis*, A form 12 *Huteri*, Milde, Fil. Europ. 149. *C. retusa*, Dene. in Jacquem. Voy. Bot. t. 177.

North-west Himalaya; from Kashmir and Baltistan to Kumaon, alt. 10,000–15,000 feet, not rare. Sikkim, *T. Thomson*.—Distrib. Central Asia, and in almost the whole globe in cold regions.

Fronds 4–6 in., sometimes a foot, always weak, glabrous. Requires to be separated with care from the small high-level *Athyriums*; examples in over-ripe fruit can hardly be safely distinguished.

14. LINDSAYA, Dryand.

1. *L. CULTRATA*, Swartz, Syn. Fil. 119. Frond simply pinnate; scales of the rhizome linear; pinnæ unequal-sided, lower edge nearly straight near the main nerve; veins free, or uniting only at the base of the sori.—Hk. & Grev. Ic. Fil. t. 144; Hook. Sp. Fil. i. 203; Blume, Enum. Pl. Jav. Fil. 216; Hook. Fil. Exot. t. 67; Bedd. Ferns South. Ind. t. 23; Hk. & Baker, Syn. Fil. 105; Benth. Fl. Austral. vii. 719. *L. lucida*, Blume, Enum. Pl. Jav. 216; Hook. Sp. Fil. i. 206; Wall. Cat. 145. *L. gracilis*, Blume, Enum. Pl. Jav. Fil. 216; Hook. Sp. Fil. i. 207. *L. odorata*, Roxb. in Calc. Journ. Nat. Hist. iv. 511. *L. Lobbiana*, Hook. Sp. Fil. i. 205, t. 62 c; Bedd. Ferns Brit. Ind. t. 28. *L. attenuata*, Wall. Cat. 151. *L. pallens*, Wall. Cat. 148.

From Nepaul to Mishmee and Chittagong, alt. 0–4000 feet, very common.—Distrib. Mts. of the South Deccan and Ceylon, Malay Peninsula and Islands, North Australia, Formosa, Japan, East-African Islands.

Rhizome wiry, tangled, subterranean; stipes approximate. Taking the two extreme

forms, var. 1 may be 2-4 in. high, growing in river-sand, the pinnæ small, very coriaceous and hard, all slanting towards the vertex of the frond; var. 2 in rich soil may be 18 in. high, with large herbaceous pinnæ spreading horizontally. All intermediate forms may be found.—*Lindsaya attenuata*, Wall. Cat. 2192, is quite remote from *L. attenuata*, Wall. Cat. 151, and comes from Herb. Finlayson, probably collected in Siam or Cochin-China.

2. *L. REPENS*, Bedd. Ferns South. Ind. tt. 209, 214. Frond simply pinnate; scales of the rhizome lanceolate; pinnæ unequal-sided, lower edge nearly straight near the main nerve; veins free, or uniting only at the base of the sori.—*L. pectinata*, Blume, Enum. Pl. Jav. Fil. 217; Hook. Sp. Fil. i. 207; Hk. & Baker, Syn. Fil. 106. *L. oblongifolia*, Hook. Sp. Fil. i. 206, t. 61. *Lindsaya*, sp., Griff. Ic. Pl. As. 115 v, Notul. i. ii. 614. *Davallia Boryana*, Presl; Hook. Sp. Fil. i. 175; Hk. & Grev. Ic. Fil. t. 143. *D. hemiptera*, Hook. Sp. Fil. i. 176. *L. repens*, Desv.; Hk. & Baker, Syn. Fil. i. 93. *Dicksonia repens*, Swartz, Syn. Fil. 138. *Odontoloma repens*, J. Smith; Hk. & Bauer, Gen. Fil. t. 114 B. *O. Boryanum*, Fée, Gen. Fil. t. 26 A. fig. 2.

Mishmee and Khasia, *Griffith*. Sikkim Terai; Dulkajhar, alt. 1000 feet, *N. Gamble*.—Distrib. Ceylon, Malay Peninsula and Islands, Polynesia, Mauritius.

Rhizome stout, usually climbing. Fronds 12-18 in., very much like the large form of *L. cultrata*, but the rhizome and scales differing.—This is a very rare fern in North India, having apparently been collected but on three occasions. The locality, Nilgherries, given for it by Mr. Baker, is objected to by Col. Beddome; and I can find no Nilgherry example at Kew. *Lindsaya pectinata* and *Davallia repens* of Hk. & Baker, Syn. Fil., are so identical that I imagine the two are only retained in the text because stereotyped. Both species are attributed to North India on the faith of Griffith's three sheets, two of which (collected from the same plant?) are arranged one in the *Davallia repens* bundle, the other in the *Lindsaya pectinata* bundle. Baker doubts whether *L. scandens*, Hk., is distinct; but Mr. Baker has marked one sheet *L. pectinata*, which I consider typical *L. scandens*, and this, of course, spoils all. There remains the question whether the species should be called *Lindsaya* or *Davallia*. I should resolve this by transferring the whole section *Odontoloma* to *Lindsaya*.

3. *L. FLABELLULATA*, Dryand. in Trans. Linn. Soc. iii. 41, t. 8. Frond bipinnate or simply pinnate; veins free; pinnæ without a distinct midrib, flabellulate-veined, curved or excised on the lower margin.—Hk. & Grev. Ic. Fil. t. 75; Hook. Sp. Fil. i. 211; Bedd. Ferns South. Ind. t. 216; Hk. & Baker, Syn. Fil. 107; Benth. Fl. Austral. vii. 720. *L. tenera*, Dryand. in Trans. Linn. Soc. iii. 42, t. 10; Wall. Cat. 146; Hook. Sp. Fil. i. 211; Bedd. Ferns South. Ind. t. 24. *L. striata*, Blume, Enum. Pl. Jav. Fil. 220. *L. polymorpha*, Wall. Cat. 147; Hk. & Grev. Ic. Fil. t. 75. *L. interrupta*, Wall. Cat. 2195. *Vittaria interrupta*, Roxb. in Calc. Journ. Nat. Hist. iv. 511. *Davallia trichomanoides*, Bedd. Ferns Brit. Ind. t. 178, not of Blume. *D. schizophylla*, Hk. & Baker, Syn. Fil. 468.

Khasia and Assam, Griffith. Jaintea; Jarain, alt. 4000 feet, C. B. Clarke.—Distrib. Mts. of South India and Ceylon, Malay Peninsula and Islands, South China, North Australia.

Stipes tufted, sometimes strongly dimorphic; the barren fronds 2-3 in., simply pinnate, on stipes 1 in.; the fertile fronds 3-5 in., more or less compound, on stipes 4-5 in. The simply pinnate form may be passed in the field for *L. cultrata*, and is perhaps not rare in North India; but it appears to have been collected there on three occasions only.

4. *L. ENSIFOLIA*, Swartz, Syn. Fil. 118. Frond usually pinnate, with entire narrow lanceolate pinnae; veinlets reticulating.—Hk. & Grev. Ic. Fil. t. 111; Hook. Sp. Fil. i. 220; Hook. Garden Ferns, t. 62; Hk. & Baker, Syn. Fil. 112; Luerssen, Fil. Graeff. 226; Benth. Fl. Austral. vii. 721. *L. lanceolata*, Labill. Pl. Nov. Holl. ii. 98, t. 248. *L. Griffithiana*, Hook. Sp. Fil. i. 219, t. 68 B. *L. pentaphylla*, Hook. Sp. Fil. i. 219, t. 67. *L. pteroides*, Wall. Cat. 2193. *L. longipinna*, Wall. Cat. 2194. *Schizoloma ensifolium*, Bedd. Ferns South. Ind. t. 25. *S. Griffithianum*, Bedd. Ferns Brit. Ind. t. 29. *Pteris angustata*, Wall. Cat. 93.

From Sikkim to Muneypoor and Chittagong, alt. 500-4000 feet, frequent.—Distrib. South Deccan and Ceylon, Malay Peninsula and Islands to Polynesia and North Australia. Tropical and Southern Africa with its eastern islands.

Rhizome creeping somewhat widely. Pinnæ often few, sometimes one only; rarely with long lobes. There is very little of this at Kew from North India; but it is by no means rare. Collectors have perhaps often passed it supposing it to be the common *Pteris cretica*.—As to the name, Mettenius keeps up Labillardière's *L. lanceolata*, which was published in the same year as Swartz's. I cannot discover which has the right of priority, and therefore follow Mr. Baker.

[*Lindsaya Finlaysonian*, Wall. (i. e. *L. heterophylla*, Hk. & Baker, Syn. Fil. 112, partly), is stated by Beddome (Ferns Brit. Ind. Suppl. p. 6) to grow in North India; but there is no example further north than the Nilgherries in the Kew Herbarium, and I suspect some error.]

15. ADIANTUM, Linn.

* *Simply pinnate.*

1. *A. LUNULATUM*, Burm. Fl. Ind. 235. Pinnæ glabrous, their petioles usually $\frac{1}{8}$ - $\frac{1}{4}$ in. or more.—Hk. & Grev. Ic. Fil. t. 104; Wall. Cat. 77; Blume, Enum. Pl. Jav. Fil. 215; Hook. Fil. Sp. ii. 11; Carr. in Fl. Viti. 346; Bedd. Ferns South. Ind. t. 1; Milde, Fil. Europ. 28; Hk. & Baker, Syn. Fil. 114; Benth. Fl. Austral. vii. 723. *A. dolabriforme*, Hook. Ic. Pl. t. 191. *A. filiforme*, Hook. Ic. Pl. t. 503. *Pteris lunulata*, Retz. Obs. ii. t. 4; Roxb. in Calc. Journ. Nat. Hist. iv. 506.

Throughout North India, in moist places, alt. 0-4500 feet; very common.—Distrib. South India and Ceylon, Malay Peninsula, the tropics of nearly the whole world.

One of the most generally diffused of Indian Ferns, plentiful in ditches in Calcutta. In the hills it has sometimes large pinnæ 1 in., sometimes small $\frac{1}{8}$ in. which are occa-

sionally nearly orbicular.—*A. soboliferum*, Wall. Cat. 74 (from Ava), referred here by Baker l. c., does not belong; it is nearer *A. caudatum*.

2. *A. CAUDATUM*, Linn. Mant. 308. Pinnæ hairy, their petiole rarely exceeding $\frac{1}{2}$ in.—Roxb. in Calc. Journ. Nat. Hist. iv. 512; Hook. Exot. Flora, t. 104; Hook. Sp. Fil. ii. 12; Bedd. Ferns South. Ind. t. 2; Milde, Fil. Europ. 29; Hk. & Baker, Sp. Fil. 125. *A. ventosum*, Wall. Cat. 75. *A. flagelliferum*, Wall. Cat. 76. *A. gracilifolium*, Roxb. in Calc. Journ. Nat. Hist. iv. 512. *A. hirsutum*, Wall. Cat. 217. *A. ellipticum*, Blume, Enum. Pl. Jav. Fil. 215.

Throughout North India, alt. 0–3000 feet, very common.—Distrib. South India and Ceylon, Malay Peninsula and Islands to South China, Tropical Africa to the Verdes.

Var. *rhizophorum*, Wall. Cat. 82. Pinnæ and stipe glabrous, or nearly so.—Hook. Sp. Fil. ii. 12, t. 80 A. *A. Edgeworthii*, Hook. Sp. Fil. ii. 14, t. 81 B; Bedd. Ferns Brit. Ind. t. 17.

Gurwhal, *Edgeworth*, *A. Hume*, *Hope*. Nepaul, *Wallich*. Mooltan, *Edgeworth*.

** *Frond usually 2- (or 3-4-) pinnate.*

3. *A. CAPILLUS-VENERIS*, Linn. Sp. Pl. 1558. Frond usually 2-pinnate; segments very thin.—Engl. Bot. t. 1564; Wall. Cat. 73; Hk. & Bauer, Gen. Fil. t. 66 B; Hook. Sp. Fil. ii. 36, t. 74 B; Hook. Brit. Ferns, t. 41; Bedd. Ferns South. Ind. t. 4; Milde, Fil. Europ. 30; Hk. & Baker, Syn. Fil. 123; Benth. Fl. Austral. vii. 723. *A. capillus*, Wall. Cat. 73. *A. tenerum*, Roxb. in Calc. Journ. Nat. Hist. iv. 513, not of Swartz.

Chittagong; Barobkoondo and Sectakoondo, *J. Scott*, *C. B. Clarke*. Khasia, Assam, Sikkim, rare. From Nepaul to Kafaristan, plentiful.—Distrib. Malabaria, from Bombay to Ceylon (rare); from Cabul to England and Morocco; in tropical and temperate Africa and America; Queensland.

4. *A. VENUSTUM*, Don, Prodr. Fl. Nep. 17. Frond 3-4-pinnate; segments somewhat rigid.—Wall. Cat. 81; Hook. Sp. Fil. ii. 40, t. 76 B; Bedd. Ferns Brit. Ind. t. 20; Hk. & Baker, Sp. Fil. 125. *A. microphyllum*, Roxb. in Calc. Journ. Nat. Hist. iv. 513.

Nepaul, *Wallich*. Gurwhal to Kashmir, alt. 3000–10,000 feet, abundant.—Distrib. Cabul.

One of the commonest ferns of the North-east Himalaya. Sir W. J. Hooker gives also Khasia as a locality; but I find no example thence, and Mr. Baker confines the species (I believe correctly) to the Himalaya.

*** *Fronds dichotomous.*

5. *A. PEDATUM*, Linn. Sp. Pl. 1557. Rhachis glabrous, once-forked, the pinnæ placed scorpioid-like on each fork.—Schkuhr, Crypt. t. 115; Hook. Sp. Fil. ii. 28; Bedd. Ferns Brit. Ind. t. 167; Milde, Fil. Europ. 31; Hk. & Baker, Syn. Fil. 126.

North-west Himalaya, alt. 6000–9000 feet, scattered, not plentiful; from Gurwhal (*Strachey & Winterbottom*) to Sikkim (*Sir J. D. Hooker*).—Distrib. Japan, North America (nearly the whole).

6. *A. FLABELLULATUM*, Linn. Sp. Pl. 1557. Scales on the rhizome long, linear, lax, chestnut-coloured; rhachis hairy, repeatedly dichotomous; segments glabrous; sori often $\frac{1}{10}$ in. broad.—Hook. Sp. Fil. ii. 30; Bedd. Ferns South. Ind. t. 218; Hk. & Baker, Syn. Fil. 126, not of Wall. *A. amœnum*, Wall. Cat. 78; Hk. & Grev. Ic. Fil. t. 103.

Nepaul, *Wallich*. Assam, *Simons*. Khasia, *Hk. f. & T., T. Lobb*. Sylhet, *Hk. f. & T.*—Distrib. Ceylon, Malay Peninsula and Islands, South China, and Japan.

In *A. hispidulum*, Swartz (*A. flabellulatum*, Wall. Cat. 2177, not of Linn.), the scales on the rhizome are lanceolate, shining black, rigid, adpressed; the sori scarcely $\frac{1}{10}$ in. broad.

16. CHEILANTHES.

* *Fronds not powdered beneath; stipe and main rhachis scaly and hairy.*

1. *CH. FRAGRANS*, Swartz, Syn. Fil. 127, 325, 326, t. iii. fig. 6. Frond bipinnate, tripinnatifid, or tripinnate; ultimate segments $\frac{1}{8}$ in. in diam., ovate or round, without hairs beneath.—Webb & Berth. Phyt. Canar. iii. 452; Mett. Ferngatt. Cheil. 38; Hook. Sp. Fil. ii. 81; Milde, Fil. Europ. 34; Bedd. Ferns Brit. Ind. t. 338; Hk. & Baker, Syn. Fil. 134. *Ch. odora*, Swartz, Syn. Fil. 127, 327; Schkuhr, Crypt. t. 123. *Ch. suaveolens*, Swartz, Syn. Fil. 127; Sibth. Fl. Græc. t. 966. *Polypodium fragrans*, Linn. Mant. 307, not Sp. Pl. 1550.

Mts. S. of Kashmir; Murree, alt. 4000–5000 feet, *H. C. Levinge*. Kishtwar, alt. 3500–5000 feet, *C. B. Clarke*.—Distrib. Cabul, all round the Mediterranean, Macaronesia.

The partial rhachises are often scaly and hairy with chestnut submoniliform hairs; but the surface of the frond beneath is entirely devoid of the plentiful white curled woolly hairs so abundant in the next species.—Mr. Baker carefully follows Sir W. J. Hooker in stating that the present species is not Swartz's *Cheilanthes fragrans*, while they both say it is *Polypodium fragrans* of Linnæus's 'Mantissa.' Swartz (Syn. Fil. 326) states not only that his *Ch. fragrans* is Linnæus's *Polypodium fragrans*, but that to prevent confusion he obtained, through Sir J. E. Smith, from Linnæus's Herbarium the *ipseissimum exemplum* collected by Kœnig on which Linnæus founded the species. I suspect that the whole blunder arose because Webb and Berth. supposed Kœnig's example to have come from India, and that therefore their own Macaronesian fern would be something different. Sir W. J. Hooker (Sp. Fil. ii. 94) says that Swartz's *Ch. fragrans* was of Indian origin, gathered by Kœnig probably in the Madras Peninsula; but on turning to Linn. Mant. 307 it will be seen that Kœnig's specimen was collected, not in India, but on the walls of Funchal, where it grows now.

2. *CH. SZOVITZII*, Fisch. & Meyer, in Bull. Soc. Mosc. 1838, 241. Frond bipinnate, tripinnatifid or tripinnate; ultimate segments $\frac{1}{8}$ in. in diam., round, with many crisped

white hairs beneath.—Hook. Sp. Fil. ii. 98, t. 94 B ; Mett. Farngatt. Cheil. 37 ; Milde, Fil. Europ. 33 ; Bedd. Ferns Brit. Ind. t. 145 ; Hk. & Baker, Syn. Fil. 139. *Ch. fimbriata*, Vis. Fl. Dalm. t. 1. fig. 1. *Notholæna persica*, Bory in Bélanger. Voy. 23.

Kashmir and Baltistan ; alt. 5000–7500 feet, frequent. Kulu, Edgeworth.—Distrib. Cabul, West Asia, South Europe.

Exceedingly like *Ch. fragrans*, and only to be distinguished by the indusial hairs. The hairs are really confined to the sori, which occupy a large portion of the very small segments, so that the lower surface of the frond appears densely matted. *Ch. Szovitzii* is the oldest name. *Notholæna persica* is 4 years later than the full description of *Ch. Szovitzii* by Fisch. & Meyer.

** *Fronds not powdered beneath ; stipe not hairy, sometimes slightly scaly.*

3. CH. VARIANS, Hook. Sp. Fil. ii. 89, t. 103 A. Glabrous ; frond long-lanceolate, pinnate ; pinnæ subentire, pinnatifid or with a few secondary pinnæ ; involucres attaining $\frac{1}{2}$ – $\frac{1}{4}$ in.—Bedd. Ferns South. Ind. t. 189 ; Hk. & Baker, Syn. Fil. 127. *Pteris varians*, Wall. Cat. 86. *Pt. cæspitosa*, Wall. Cat. 90.

East Bengal Plain from Assam to Chittagong, general on red Terai soil : ascending the Khasi range to 2000 feet alt.—Distrib. Moulmein, Ava, South China, Luzon. Anamallays (*Beddome*).

This is a fern of the plains ; common at Dacca. Mr. Baker says its locality is the Himalaya ; but I never saw it there, nor is there any example thence at Kew. Mr. Baker also does not admit Col. Beddome's locality in Malabar ; but Col. Beddome's figure above quoted is so exactly the plant, that I suppose Mr. Baker suspected that Col. Beddome did not prepare it from his Anamallay plant.

4. CH. TENUIFOLIA, Swartz, Syn. Fil. 129, 332. Glabrous ; frond triangular-lanceolate, 2–3-pinnate, secondary pinnæ numerous ; involucres rarely exceeding $\frac{1}{2}$ in. (though often confluent in age).—Schkuhr, Crypt. t. 125 ; Blume, Enum. Pl. Jav. Fil. 137 ; Hook. Sp. Fil. ii. 82, t. 87 c ; Carr. in Fl. Viti. 347 ; Mett. Farngatt. Cheil. 27 ; Bedd. Ferns South. Ind. t. 188 ; Hk. & Baker, Syn. Fil. 138 ; Benth. Fl. Austral. vii. 726. *Ch. micrantha*, Wall. Cat. 68, as to type sheet. *Ch. rupestris*, Wall. Cat. 67. *Ch. Sieberi*, Kunze ; Hook. Sp. Fil. ii. 83, t. 97. *Pellæa nudiuscula*, Hook. Sp. Fil. ii. 151. *Pteris gracilis*, Roxb. in Calc. Journ. Nat. Hist. iv. 508. *Trichomanes tenuifolia*, Burm. Fl. Ind. 237.

Bengal Plain ; alt. 0–2000 feet, common on red soil, as in Assam, Chittagong, Dacca, and throughout Chota Nagpore : ascends the Khasi range to 3500 feet alt. Sikkim, alt. 1000 feet.—Distrib. Deccan and Ceylon, Malay Peninsula and Islands, extending to China, Australia, New Zealand, Polynesia, Uruguay.

This fern is also said by Mr. Baker to be confined in North India to the Himalayas : there is no example from the Himalaya in the Kew Herbarium, but I have collected it in Sikkim. Wall. Cat. 68 has *Pellæa nitidula*, Baker, mixed with it. There is a marked

difference in cutting between the Deccan and East Bengal examples; the figure of Sir W. J. Hooker represents the East Bengal type; the figure of Col. Beddome represents the Chota Nagpore type. Chota Nagpore is, phytographically as well as geographically and geologically, the north-east extremity of the Deccan Plateau.

*** *Fronds with some powder or hair beneath (but Ch. farinosa, var. Dalhousiæ, often denudate when old).*

5. *CH. SUBVILLOSA*, Hook. Sp. Fil. ii. 87, t. 98 B. Frond elongate-lanceolate; the lowest pair of pinnae distant, narrower than the pair above; stipe shorter than the frond, glabrous, with a few broad-lanceolate uniform-coloured scales near the base; rhachis of primary pinnae with crisped woolly salmon-coloured hairs beneath, but no scales; involucre continuous, slightly crenulate, not fimbriate on the margin.—Mett. *gatt. Cheil.* 48; *Bedd. Ferns Brit. Ind.* t. 142; *Hk. & Baker,*

North-west Himalaya; Pabur Valley and Kotghur, near Simla,

Scales of the rhachis light-chestnut-coloured or scarious. Main rhachis glabrous beneath, the partial rhachises woolly. Pinnae often 8–10 pairs, separate, the lower 2 in. apart. Involucre as in *Pellaea*, to which this species might be referred. In this and the neighbouring species of *Cheilanthes* the margin of the frond is at first reflexed, continuous, becoming in the age of the fruit beaded or broken up; in *Pellaea* the margin is continuous in age; the distinction is very small.—Col. Beddome expresses an opinion that this species is only a form of *Ch. farinosa*; but he has perhaps never seen it, his figure being taken from Sir W. J. Hooker's. There is no powder on the examples, of which, however, there are but 2 sheets at Kew.

6. *CH. ALBO-MARGINATA*, C. B. Clarke. Frond lanceolate; the lowest pair of pinnae usually more developed than any superior pair; stipe shorter than the frond, glabrous, with many lanceolate white-margined scales; pinnae, when young, densely scaly beneath, often with yellow powder also, but not hairy, when old usually scaly beneath on the rhachises; involucre peltate, usually lacerate on their margins. (Pl. LII.)

North-west Himalaya, *Falconer*. Kashmir; Basaoli, alt. 5000 feet, *C. B. Clarke*. Dalhousie, alt. 6000 feet, *C. B. Clarke*. Simla, alt. 7000 feet, *T. Thomson*. Gurwhal, alt. 2000–9000 feet, *H. C. Levinge*.—Distrib. Nilgherries, fide *Major F. Henderson*.

Scales on the lower part of the stipe numerous, lanceolate-linear, secund, ascending, somewhat rigid, dark chestnut, nearly black in the centre, their margins glistening white; tufts of hair-pointed scales on the rhizome. Young fronds usually entirely thickly covered beneath with lanceolate chestnut coloured scales, and generally with yellow powder, in which state it has been confused with *Ch. rufa*; but it has none of the woolly hairs in which *Ch. rufa* always abounds. This is probably what Col. Beddome means when he says (*Ferns, Suppl.* p. 7) that “he has lately obtained typical *farinosa* on the same root with *rufo*.” The yellow powder usually disappears with age; but traces of it are sometimes permanent.—I have collected large quantities of this fern, as has *H. C. Levinge*.

7. *CH. RUPA*, Don, Prodr. Fl. Nep. 16. Frond lanceolate; lowest pair of pinnae usually smaller than the next superior pair; stipe and whole frond beneath woolly with crisped hairs; margin of involucre much fimbriate.—Hook. Sp. Fil. ii. 79, t. 99 A; Mett. Farngatt. Cheil. 47; Bedd. Ferns Brit. Ind. t. 144; Hk. & Baker, Syn. Fil. 141. *Ch. tomentosa*, Herb. Wall.

Khasia; alt. 4000 feet, plentiful wherever there is limestone. Sikkim; alt. 5000 feet, rare (as is limestone). Gurwhal, alt. 2000 feet, *H. C. Levinge*.—Distrib. Mergui.

I have collected much of this fern, but only on limestone; it is generally closely pro-cumbent, curling up on the rock, and easily recognized by its woolly hairiness. Scales often none, or undistinguishable from the hairs; scales, when present on the stipe mixed with the hairs, are narrow-linear uniform-coloured. Fronds above laxly flocculose or woolly, or almost tomentose.—Col. Beddome remarks (Ferns, Suppl. p. 7) that Wallich was right in calling this plant *Ch. farinosa*, var. *vestita*; but Wallich calls it *Ch. tomentosa* in his Herb., and some other hand (apparently) has directed it to be put "with Fl." i. e. *Ch. farinosa*.

8. *CH. FARINOSA*, Kaulf. Enum. Fil. 212. Frond triangular-lanceolate or long-lanceolate; lowest pair of pinnae often distant, as much developed as any of the superior pinnae; stipe shorter than the frond, glabrous, with some lanceolate-linear uniform-coloured scales near the base; pinnae without hairs beneath, rarely with a few scales, always more or less powdered; involucre usually toothed, sometimes lacerate.—Hk. & Grev. Ic. Fil. t. 134; Hook. Sp. Fil. ii. 77; Bot. Mag. t. 4765; Mett. Farngatt. Cheil. 46; Bedd. Ferns South. Ind. t. 191; Hk. & Baker, Syn. Fil. 142. *Ch. dealbata*, Don, Prodr. Fl. Nep. 16; Wall. Cat. 71, as to type sheet. *Ch. rigidula*, Wall. Cat. 2175. *Ch. bullosa*, Bedd. Ferns South. Ind. t. 192. *Pteris farinosa*, Forskh. Fl. Ægypt. Arab. 187. *Pt. bicolor*, Roxb. in. Calc. Journ. Nat. Hist. iv. 507.

Throughout Northern India, in the hills, alt. 0–5000 feet from Kashmir to Assam and Chittagong; also in Chota Nagpore.—Distrib. Whole Deccan and Ceylon; Eastern Africa with its islands and Arabia; Java and the Philippines; Tropical America.

This species is easily separable from *Ch. rufa* and *Ch. albomarginata* above. I cannot separate it satisfactorily from *Ch. argentea*, var. *chrysophylla*. All the India examples are white- or pale-yellow-powdered below, except a very large dark-green form sent by Mr. Batcock from Ootacamund, marked var. *concolor*.

Var. *Dalhousiæ* (sp.), Hook. Sp. Fil. ii. 10. Pinnae (even when young) without hairs, scales, or powder beneath; involucres deeply crenulate, toothed or lacerate on the margin.—Hk. & Baker, Syn. Fil. 137. (Pl. LI.)

Western Himalaya, from Kashmir to Kumaon, alt. 6000–9000 feet, frequent. Sikkim; Lachen, alt. 10,000 feet, *Sir J. D. Hooker*.—Hook. Sp. Fil. ii. t. 78 B, is named *Ch. dealbata*, but quoted at page 80 for *Ch. Dalhousiæ*; but Mr. Baker has withdrawn it, as it is taken from a sheet of examples containing a mixture of forms.—Bedd. Ferns South. Ind. t. 193, does not show the rhizome and lower scales; nor is the cutting that of *Ch. Dalhousiæ*; all Col. Beddome's examples of *Ch. Dalhousiæ* communicated from the

Deccan exhibit more or less powder, and I should call them *Ch. farinosa* type. Sorting the specimens my own way, I fancy that I can keep *Ch. Dalhousiæ* distinct; but I bow to the opinion of Baker and F. Henderson, and rank it as a variety.

Var. *chrysophylla*, Hook. Fil. Exot. t. 95. fig. 1. Frond triangular-lanceolate, with sometimes 6–8 pairs of free pinnæ; powder beneath golden, never white, sometimes scanty.—*Ch. chrysophylla* (sp.), Hook. Sp. Fil. ii. 113; Hook. Ic. Pl. t. 901; Mett. Farngatt. Cheil. 47.

Khasia; alt. 5500 feet, not rare. Sikkim, *W. S. Atkinson*.—This is a most doubtful plant, that has been confused with *Ch. argentea*, var. *sulphurea*, to which it bears little resemblance except in having yellow powder beneath. Both *W. S. Atkinson* and Major *F. Henderson* think it should be appended to *Ch. farinosa* rather than to *Ch. argentea*.

9. *CH. ARGENTEA*, Kunze in *Linnaea*, 1850, 242. Frond triangular; lowest pair of pinnæ most developed, approximate; remainder of the frond pinnatifid or with one other free pair of pinnæ; stipe glabrous, often longer than the frond, with sublinear scales near the base; pinnæ glabrous beneath, but with white powder; involucre crenate, rarely much toothed.—Hook. Sp. Fil. ii. 76; Mett. Farngatt. Cheil. 45; Bedd. Ferns Brit. Ind. t. 143; Milde, Fil. Europ. 37; Hk. & Baker, Syn. Fil. 142. *Pteris argentea*, Gmel.; Langsd. & Fisch. Pl. Voy. Russes, t. 22.

Khasia; alt. 3000–5500 feet, frequent.—Distrib. Mergui, Northern Asia to Siberia, Japan, and Kamtschatka.

In my typical example the stipe is $8\frac{1}{2}$ in., the frond $3\frac{1}{4}$; free pinnæ one pair only, very white beneath.

Var. *sulphurea*, Hook. Fil. Exot. t. 95. fig. 3. Exactly as in the type, but the powder often yellow or golden.

Khasia and Mergui; growing sometimes on the same rhizome with white-powdered fronds.

17. *ONYCHIUM*, Kaulf.

1. *O. AURATUM*, Kaulf. Enum. Fil. 144. Coriaceous, shining on both surfaces; barren frond sub-4-pinnate, fertile frond 3-pinnate; some of the involucre often exceeding $\frac{1}{2}$ in.; ripe capsules golden.—Hook. Sp. Fil. ii. 121; Fée, Gen. Fil. 131, t. 7. fig. C; Bedd. Ferns South. Ind. t. 30; Hk. & Baker, Syn. Fil. 143. *Lomaria aurea*, Wall. Cat. 38. *L. caruifolia*, Wall. Cat. 39. *L. decomposita*, Don, Prodr. Fl. Nepal. 14. *Pteris chrysocarpa*, Hk. & Grev. Ic. Fil. t. 107.

From Nepaul to Assam and Chittagong, alt. 0–4000 feet, common: sometimes found far from the hills in East Bengal.—Distrib. Malay Peninsula and Islands, New Guinea.

In large tufts. Scales numerous at the base of the stipe, linear, chestnut-coloured. Involucre on the terminal segments much longer than the others.—The form *L. caruifolia*, with shorter sori, less golden capsules (from Amherst), is marked by Kurz as a var. of *O. japonicum*, to which view Capt. F. Henderson inclines. Mr. Baker agrees with me that it is better placed with *O. auratum*.

2. *O. JAPONICUM*, Kunze, in Schkuhr, Fil. Suppl. 11. Coriaceous, shining on both surfaces, especially the upper; fertile frond often 4-pinnate, as much divided as the barren; no involucre attaining $\frac{1}{2}$ in.; ripe capsules deep brown, numerous, broader than the segment, and forcing the involucre completely open.—Hook. Sp. Fil. ii. 122; Hk. & Baker, Syn. Fil. 143. *O. lucidum*, Spreng.; Hk. & Bauer, Gen. Fil. t. 11; Hook. Sp. Fil. ii. 121. *O. capense*, Kaulf. Enum. Fil. 145, t. 1. fig. 8. *Cheilanthes lucida*, Wall. Cat. 69. *Trichomanes japonicum*, Thunb. Fl. Jap. 340.

From Gurwhal to Mishmee and Khasia, alt. 3000–6000 feet; common from Nepaul eastward.—Distrib. Ava, China, Japan.

Tufted. Scales at the base of the stipe numerous, linear, pale brown.

- Var. *multisecta*, (sp.) F. Henderson, MS. Fertile frond very finely cut, often 5-pinnate; ripe capsules straw-coloured, not numerous; involucre remaining closed over the ripe capsules. *Cheilanthes contigua*, Wall. Cat. 72. *Leptostegia lucida*, Don, Prodr. Fl. Nepal. 14.

From Kumaon to Kashmir, alt. 6000–8000 feet, frequent.—Frond herbaceous, hardly shining, not coriaceous.—This is more easily separated from *O. japonicum* type than is *O. auratum*, and has been estimated a species both by Wallich and F. Henderson, to which opinion the area lends support. But if it is estimated a species, I do not know to which the next variety should be attached.

- Var. *intermedia*. Frond lax, more coarsely cut; involucres often $\frac{1}{2}$ in.—*O. lucidum*, Bedd. Ferns Brit. Ind. t. 21.

Kumaon; alt. 7500 feet. Sikkim; Lachen, alt. 9000–1000 feet, Sir J. D. Hooker.—This form, exactly figured by Col. Beddome, seems halfway between *O. japonicum*, Kunze, and *O. multisectum*, F. Henderson. [After going through the Kew material with me, F. Henderson would still prefer to make *O. multisectum* a species.]

18. CRYPTOGRAMME, R. Br.

1. *C. CRISPA*, R. Br. in Richardson's Append. to Franklin's First Journal, 54.—Hk. & Bauer, Gen. Fil. t. 115 B; Hook. Sp. Fil. ii. 128–130; Hook. Brit. Ferns, t. 39; Hk. & Baker, Syn. Fil. 144. *C. Brunoniana*, Wall. Cat. 396; Hk. & Grev. Ic. Fil. t. 158; Bedd. Ferns Brit. Ind. t. 164. *C. acrostichoides*, Hk. & Grev. Ic. Fil. t. 29. *Allosorus crispus*, Bernh. in Schrad. neu. Journ. Bot. ii. 36; Milde, Fil. Europ. 23. *Phorolobus crispus*, Desv.; Fée, Gen. Fil. 130, t. 7 D. *Pteris crispa*, Linn. MS.; Engl. Bot. t. 1160. *Osmunda crispa*, Linn. Sp. Pl. 1522.

From Kumaon to Kashmir and Baltistan; alt. 10,000–15,000 feet, plentiful. Sikkim; alt. 10,000–14,000 feet (head of Lachen valley), Sir J. D. Hooker.—Distrib. Arctic and Alpine Europe, Asia and North America.

Glabrous, tufted; scales at the base of the stipe lanceolate acute, pale brown; often a few ovate-lanceolate acute similar scales scattered on the lower part of the stipe. Fertile frond wholly fertile, i. e. not with the lowest pinnæ barren.—I can see no difference between the Himalayan and European plants, nor can I distinguish any Himalayan variety. Milde says the Himalayan form has the barren fronds with the

ultimate segments more acutely serrate; but I suspect Milde's stock of Himalayan material on which he ventured this distinction was small. I have collected the plant more than twenty times between Dhurmsala and the Karakorum. None resemble the American var. *acrostichoides*.—The name of this fern is a quest. vex. Most writers prefer *Allosorus crispus*, Bernh., who first separated the species from *Pteris*; but *Allosorus* has been so variously understood that the genus has been altogether dropped by Sir W. J. Hooker.

19. PELLÆA, Link.

1. *P. GRACILIS*, Hook. Sp. Fil. ii. 138, t. 133 B. Glabrous; rhizome wiry, creeping; stipes not tufted; fronds 1-2-pinnate, often with the lowest pinnae barren, the upper fertile; young sori subterminal on the veins, clustered, not forming a marginal line till old.—Hk. & Baker, Syn. Fil. 145. *Allosorus Stelleri*, Ruprecht, in Ledeb. Fl. Ross. iv. 526; Bedd. Ferns Brit. Ind. t. 73. *A. gracilis*, Asa Gray, Man. Bot. (ed. v.) 659, t. 15. *Pteris gracilis*, Michx. Fl. Bor.-Amer. ii. 262. *Pt. Stelleri*, Gmel. fide Ruprecht, l. c.

Balti; alt. 9000 feet, *T. Thomson*. Kumaon; Champua, alt. 10,000 feet, *Strachey & Winterbottom*. Kashmir; Pir Punjul, alt. 11,000 feet, *C. B. Clarke*. Karakorum; alt. 11,500-13,000 feet, *C. B. Clarke*.—Distrib. Lake Baikal region, Canada and Northern United States.

Scales about the base of the stipe linear, pale brown, a few scattered on the lower part of the stipe.—In the absence of young fruit and of the rhizome, Indian examples of this are easily distinguished from all forms of *Cryptogramme crispa*, in that they have frequently the fronds barren below, fertile above, as mentioned by Ruprecht for the Baikal fern. The North-American form has the barren and fertile fronds distinct, as figured by Hooker and copied by Beddome.

2. *P. TAMBURI*, Hook. Sp. Fil. ii. 134, t. 129 A. Fronds 5-3-pedatifid, the segments 1-2-pinnatifid, whitened beneath.—Hk. & Baker, Syn. Fil. 146.

East Nepal; Tambur River, *Sir J. D. Hooker*.

Once collected—viz. five fronds in fruit with the upper portions of their stipes, but no rhizome. Evidently a splendid and unmistakable species.

3. *P. NITIDULA*, Hk. & Baker, Syn. Fil. 149. Tufted; stipe and main rhachis minutely scabrid-pubescent; frond 1-2-pinnate.—*Cheilanthes nitidula*, Hook. Sp. Fil. ii. 112; Hook. Ic. Pl. t. 912; Mett. Farngatt. Cheil. 50; Bedd. Ferns Brit. Ind. t. 222; *Pteris nitidula*, Wall. Cat. 89.

Kashmir; alt. 3000-6000 feet; frequent and plentiful to Chumba; scarce eastward to the Alps of Kumaon, where Wallich originally got it.

Besides the pubescence, there are linear scales on the stipe, which are very permanent.—In the absence of the rhizome and the young fruit, this is easily distinguishable from *Cryptogramme crispa* and *Pellæa gracilis* by the pubescent stipe and rhachis; but it has

been much confounded with both these species.—In some of my examples the involucre are peltate, not continuous even in age, and the margin of the fertile frond appears from above crenulated: such examples are exactly *Cheilanthes*. In other of my examples the sori are so continuous in a line that the genus appears *Pteris*. Mr. Baker is *in mediotutissimus* in *Pellaea*.—The texture of the frond is coriaceous, shining beneath, whence Wallich's name. Sir W. J. Hooker was misled (in Sp. Fil. ii. 113) by possessing only poorly preserved specimens.

4. *P. CALOMELANOS*, Link, Fil. Hort. Berol. 61. Glabrous; frond 1-2-pinnate; ultimate segments stalked, cordate- or hastate-ovate, or rhomboidal obtuse, entire or undulately 3-lobed.—Hook. Sp. Fil. ii. 140; Hk. & Baker, Syn. Fil. 152. *Allosorus calomelanos*, Presl; Bot. Mag. t. 4769. *Pteris calomelanos*, Swartz, Syn. Fil. 106; Kunze, in Linnæa, x. 525; Bedd. Ferns Brit. Ind. t. 22. *P. hastata*, Thunb. Fl. Cap. 733, not of Swartz.

North-west Himalaya, *Royle*; below Almora, alt. 4000 feet, *Strachey & Winterbottom*; Tikri in Sirmoor, alt. 5000-6000 feet, *Edgeworth*.—Distrib. Abyssinia to Cape of Good Hope.

Only 2 sheets of this from India at Kew. Sir W. J. Hooker expresses great surprise that Kunze supposed this species a *Pteris* rather than a *Pellaea*; but I can no better than Col. Beddome see why it is not a *Pteris*.

20. *PTERIS*, Linn.

Sect. I. *Eupteris*. Veins all free. Stipes tufted. Involucra single.

* *Frond 1-pinnate; pinnae simple, none of the lower divided or pinnatifid.*

1. *P. LONGIFOLIA*, Linn. Sp. Pl. 1531; Wall. Cat. 111; Don, Prodr. Fl. Nepal. 15; Hook. Sp. Fil. ii. 157; Carr. in Fl. Viti. 348; Bedd. Ferns South. Ind. t. 83; Milde, Fil. Europ. 13; Hk. & Baker, Syn. Fil. 153; Benth. Fl. Austral. vii. 730. *P. vittata*, Linn.; Blume, Enum. Pl. Jav. Fil. 207. *P. diversifolia*, Swartz, Syn. Fil. 96, 288. *P. costata*, Bory; Blume, Enum. Pl. Jav. Fil. 208; Hk. & Arn. Bot. Beechey's Voy. t. 51. *P. acuminatissima*, Blume, Enum. Pl. Jav. Fil. 208. *P. amplexens*, Wall. Cat. 112. *P. amplexicaulis*, Roxb. in Calc. Journ. Nat. Hist. iv. 505.

From the Punjab to Assam and Chittagong, alt. 0-5000 feet; general and abundant.—Distrib. Throughout India and Malaya, and the tropical and warm temperate regions of the whole world.

Perhaps the commonest fern of North India, extending over the plains to every village. There is no example in the Herbarium west of Chumba, but I believe it extends west.—The scales on the stipe are light-chestnut-coloured, lanceolate and linear, passing into linear hispid hairs, often permanent, and sometimes extending throughout the main and partial rhachises.—What Roxburgh's *P. vittata* (in Calc. Journ. Nat. Hist. iv. 504) can be, unless it is a bad description of *P. longifolia* (as Griffith there maintains), I cannot guess. Roxburgh's figure (among the Kew drawings) shows a stout extensively creeping

rhizome throwing up solitary fronds, the rhizome and the stipe without scales, the frond with simple linear pinnæ, the lowest pinnæ not shortened, the veins all undivided, the involucre as in *P. longifolia*. It appears from Wallich's Herbarium, that even in his day Hamilton could not make out what *P. vittata*, Roxb., was, unless = *P. longifolia*, Linn.

**** Frond 1-pinnate or subdigitate; some of the lower pinnæ often 2-3-fid, scarcely 2-3-partite.**

2. *P. cretica*, Linn. Mant. 180. Lowest pair of pinnæ (and often 1-4 other pairs 2-3-fid; margin of the frond (where barren) closely or remotely spinulose-serrate; lower barren pinnæ usually acute; veins forked and simple, diverging nearly at right angles from the midrib, often very close together.—Don, Prodr. Fl. Nepal. 15; Blume, Enum. Pl. Jav. Fil. 209; Hook. Sp. Fil. ii. 160; Carr. in Fl. Viti. 348; Bedd. Ferns South. Ind. t. 39; Milde, Fil. Europ. 41; Hk. & Baker, Syn. Fil. 154. *P. læta*, Wall. Cat. 95.

From Kashmir to Assam and Chittagong, alt. 0-6000 feet, common; extending far into the plains as at Dacca, and obtained at 8000-9000 feet alt. in Sikkim by Sir J. D. Hooker.—Distrib. Deccan and Ceylon; Malay Peninsula; and in all the quarters of the globe in tropical and warm temperate climes.

The above diagnosis is intended to separate the species from *P. pellucida* and *P. crenata*. The species is very variable, and does not always satisfy the diagnosis of Mr. Baker. The barren segments are not always much broader than the fertile; the veins are often wide apart in the narrow-segmented forms, very close together in the broad-segmented forms. The fertile segments are sometimes 7 by $\frac{1}{2}$ in., sometimes 4 by $\frac{3}{4}$ in. The stipe is often densely clothed at the base with lanceolate persistent scales. The serrations of the barren margin are sometimes $\frac{1}{10}$ in. deep, close together, with white rigid points; at other times the teeth are distant, only a few to be found. The fronds are usually more dimorphic than those of *P. crenata*.

3. *P. pellucida*, Presl, Rel. Hænk. 55. Pinnæ acute, sometimes numerous, sometimes 7, 5, 3, or 1, all simple, or the lowest pair 2-fid; margin of the frond (where barren) entire, undulate, crisped, or crenulate; veins forked and simple, diverging nearly at right angles from the midrib, always close together.—Hook. Sp. Fil. ii. 161, t. 129 B; Bedd. Ferns South. Ind. t. 38; Hk. & Baker, Syn. Fil. 154. *P. venulosa*, Blume, Enum. Pl. Jav. Fil. 209; Hook. Sp. Fil. ii. 162. *P. nervosa*, Wall. Cat. 96, as to the type sheet.

From Sikkim and Bhotan to Chittagong, alt. 0-3000 feet; extending far into Bengal Plain, as at Dacca.—Distrib. Deccan Mts.; Malay Peninsula and Islands; Guinea coast.

Pinnæ usually larger and broader than those of *P. cretica*. The forms with 5 pinnæ are always (from the area given) distinctly pinnate, never digitate. The forms with 3 pinnæ from Chittagong and the Philippines are identical, and have the fertile pinnæ $\frac{3}{4}$ in. broad, the barren pinnæ 1-1 $\frac{1}{4}$ in. broad. Major F. Henderson has collected a form

in the Nilgherries the pinnæ whereof attain 18 in., which he thinks as well separated from *P. pellucida* as is *P. pellucida* from *P. cretica*.

Var. *stenophylla*, (sp.) Hk. & Grev. Ic. Fil. t. 130. Pinnæ 3-4, sometimes 2-1, sub-digitate; fertile pinnæ very long and narrow.—*P. digitata*, Wall. Cat. 91.

Gurwhal to Nepaul, alt. 3000-4000 feet.—The localities Khasia and Philippines added by Sir W. J. Hooker are errors; the Khasia specimens are *P. dactylina*; the Philippine are *P. pellucida*, with 8 pinnæ. In *P. pellucida*, when with few pinnæ, the barren pinnæ are much broader than the fertile; in var. *stenophylla* the pinnæ, both barren and fertile, are, when 8-9 inches long, hardly $\frac{1}{2}$ in. broad. In fairly developed var. *stenophylla* the stipe is often scabrid, the veins are not less marked than in the type. The stipe is usually pale straw-coloured, sometimes yellow, sometimes nearly black.—*P. scabripes*, Wall. Cat. 94, has dimorphic fronds, the stipe very scabrous, but will probably be brought as a var. under *P. pellucida*, Presl.

4. *P. DACTYLINA*, Hook. Sp. Fil. ii. 160, t. 130 A. Pinnæ 7-1 (usually 5), digitate, linear; margin (where barren) crenate-serrate, scarcely spinulose, veins wide apart.—Bedd. Ferns, Brit. Ind. t. 23; Hk. & Baker, Syn. Fil. 155.

Khasia, Griffith; alt. 4200 feet, C. B. Clarke. Sikkim and East Nepaul, Sir J. D. Hooker.

Fertile pinnæ in Griffith's example 9 by $\frac{1}{10}$ in., and the barren pinnæ 9 by $\frac{1}{8}$ in. Neither Hooker's nor Beddome's figure shows the extreme form of the species. Sir J. D. Hooker's specimens have been so thoroughly mixed with *P. cretica* in the mounting that I do not feel sure of the locality East Nepaul; nor do I feel sure that the figures were prepared without an eye to the examples of *P. cretica* mixed. The coriaceous texture and thick veins of *P. dactylina* are not much like *P. pellucida*, var. *stenophylla*; and it has been confounded with *P. cretica*, never with *P. pellucida*.

5. *P. ENSIFORMIS*, Burm. Fl. Ind. 230; Thes. Zeyl. t. 87. Lowest pair of pinnæ 2-3-fid; margin of the frond (where barren) regularly crenate-serrate; lower barren pinnæ usually obtuse; veins forked and simple, diverging at about $\frac{2}{3}$ of a right angle from the midrib, very close together.—Ham. in Wall. Cat. 7085; Hk. & Baker, Syn. Fil. 155; Benth. Fl. Austral. vii. 730. *P. crenata*, Swartz; Blume, Enum. Pl. Jav. Fil. 209; Hook. Sp. Fil. iii. 163, t. 127 A; Carr. in Fl. Viti. 349; Bedd. Ferns South. Ind. t. 35. *P. multidentata*, Wall. Cat. 2681.

From Bhotan to Chittagong, alt. 1000 feet, throughout the plain of East Bengal; common.—Distrib. South Deccan and Ceylon, Malay Peninsula, China, Tropical Australia, Polynesia.

Not easily separated from *P. cretica*. I have found the angle of the veins the best character. *P. ensiformis* has the lowest pinnæ often 3-fid (whereas in *P. cretica* they are commonly 2-fid), and the lowest pinnæ of the fertile pinnæ have often shortened rounded barren segments; also the lowest pinnæ are not rarely completely pinnate. *Pt. ensiformis*, Ham. in Wall. Cat. 2181, was probably Burmann's species; but that

number in Wallich's Herbarium is a blank sheet of paper. Mr. Baker's area, "from the Himalaya to Ceylon," is too sweeping; it is found at the base of the Eastern Himalaya, also in Ceylon.

Var. *Grevilleana*, Mett. MS., not Agardh. Margin of the frond (where barren) with some spinulose teeth; lowest pinnæ in the barren frond often pinnate, the segments or pinnules acute.

Sylhet, *Wallich*. Mishmee, *Griffith*. Khasia, *Hk. f. & T.* Chittagong Hills, *C. B. Clarke*.—This very critical form was attached to *P. cretica* in the Kew Herbarium; the venation, as well as the much divided lower pinnæ, tend more to *P. ensiformis*. The spinulose teeth puzzled Mettenius; but some undoubted examples of *P. ensiformis* have the teeth as spinulose, though not so much hooked. The fern appears to form a transition from *P. ensiformis* type to *P. heterodactyla*, Reinw., in which the pinnæ are much more compound, but which is reckoned a variety of *P. ensiformis* at Kew. Mettenius sent the present plant named *P. Grevilleana*, Agardh.

*** Frond 1-pinnate, the pinnæ pinnatifid at least half down to the rachis,
2-3-pinnate.

6. *P. GRIFFITHII*, Hook. Sp. Fil. ii. 170, t. 123 A. Frond pinnate; pinnæ nearly to the rachis, or bipinnate; ultimate segments $\frac{2}{3}$ by $\frac{1}{8}$ — $\frac{1}{10}$ in., distant, linear-oblong, obtuse, entire or very slightly crenate.—Bedd. Ferns Brit. Ind. t. 24; *Hk. & Baker*, Syn. Fil. 156.

Mishmee, *Griffith*.

A well-marked species; and, as Sir W. J. Hooker remarks, the examples are very uniform; but there are only two sheets of specimens, which look uncommonly as though Griffith cut them all from one rhizome. Botany is easy, and species very distinct, when founded on such material.

7. *P. SEMI-PINNATA*, Linn. Sp. Pl. 1534. Frond pinnate; pinnæ with their upper margin subentire, their lower deeply pinnatifid; ultimate segments $1\frac{1}{2}$ by $\frac{1}{4}$ in., narrowly lanceolate, margin (where barren) regularly serrate.—Hook. Sp. Fil. ii. 169; Hook. Garden Ferns, t. 59; Wall. Cat. 97; Bedd. Ferns South. Ind. t. 34; *Hk. & Baker*, Syn. Fil. 157. *P. flabellata*, Schkuhr, Fil. t. 93. *P. dimidiata*, Blume, Enum. Pl. Jav. Fil. 210; Roxb. in Calc. Journ. Nat. Hist. iv. 507.

East Bengal from Assam to Chittagong, alt. 0–1000 feet, common; ascending the Khasi Hills to 4000 feet alt., fide *Hk. f. & T.*—Distrib. Travancore, Malay Peninsula and Islands, China, Japan.

This fern is always easily recognized in Northern India by being semi-pinnate or rather semi-bipinnatifid. But in China and Japan the pinnæ are pinnatifid more or less on the upper margin until forms are arrived at so completely bipinnatifid that it is difficult to say what should be done with them. The fern is a plains fern, abundant at Sylhet station. I never could find it at 4000 feet alt. in the Khasi Hills. Base of the stipe hispid, with linear permanent scales.

[*P. Dalhousiae*, Hook., is placed in North India (as well as Penang) by Col. Beddome in Ferns Brit. Ind. Suppl. p. 8; but there are no examples thence at Kew, nor have I ever heard of its being found in North India.]

8. *P. QUADRIAURITA*, Retz. Obs. vi. 38. Stipe naked upwards, or minutely scabrid pubescent; frond lanceolate or ovate-lanceolate, with 3–8 subopposite pairs of pinnæ; pinnæ narrowly oblong, acuminate or cordate, cut down nearly to the rhachis into numerous narrowly oblong approximate segments $\frac{1}{2}$ by $\frac{1}{8}$ in.; rhachis above glabrous or setigerous; lowest pair of pinnæ (and sometimes several superior pairs) bipartite, rarely simple, sometimes with 2–4 secondary pinnæ descending from their lower side.—Roxb. in Calc. Journ. Nat. Hist. iv. 507; Hook. Sp. Fil. ii. 179, tt. 135 A, 134 B; Carr. in Fl. Viti. 349; Bedd. Ferns South. Ind. t. 31, Ferns Brit. Ind. t. 202; Hk. & Baker, Syn. Fil. 158; Benth. Fl. Austral. vii. 781. *P. nemoralis*, Hk. & Bauer, Gen. Fil. t. 64 A; Wall. Cat. 106, partly perhaps of Willd. *P. aspericaulis*, Wall. Cat. 107; Agardh, Recens. Gen. Pter. 22. *P. pectinata*, Don, Prodr. Fl. Nepal. 15. *P. pyrophylla*, Blume, Enum. Pl. Jav. Fil. 212; Agardh, Recens. Gen. Pter. 30. *P. spinescens*, Presl; Agardh, Recens. Gen. Pter. 30. *P. subquinata*, Wall. Cat. 104; Agardh, Recens. Gen. Pter. 21.

From the Punjab to Assam and Chittagong; alt. 0–7000 feet, very common, but not found far from the hills.—Distrib. Deccan, Ceylon, Malay Peninsula, and the tropical and subtropical regions of the world.

The above diagnosis is expanded to include what are here considered trifling varieties of this abundant fern. The number of pinnæ is variable. *P. subquinata*, Wall., with 7–5 pinnæ, is not worthy a separate name. Several varieties, as well as the type and other allied species, have bristles sometimes on the upper surface of the rhachis; and consequently different forms have been figured by different authors as the species or variety *setigera*. The pinnæ in the type species have sometimes entire tails 2–3 in.; and various less markedly caudate forms have been elevated into species. The texture eminently varies; *P. aspericaulis*, Wall., is a rigid species, coriaceous, shining, crisped when dry, often high red in the rhachis and nerves; other forms are thin membranous, others greenly herbaceous. The pinnæ are always deeply cut; when very deeply the lowest veins reach the margin above the sinus; when less deeply, at the sinus. Agardh treated this as an absolute distinction in founding species; but it cannot be worked with large material except as an auxiliary character. The ultimate segments are usually at the vertex obtuse subentire; sometimes, however, they are acute, sometimes spinulose-mucronate, very rarely serrate (as in *P. longipes*, Don, pieces of which are sometimes taken for *P. quadriaurita*): the segments in the type form are exactly narrow-oblong, slightly falcate; sometimes they are narrowed upwards; they are rarely (perhaps never) broader upwards or acuminate. The sori are very variable in their extent: Mr. Baker says they are usually continuous along the whole margin of the segment; but (as to the North Indian plants) I should say the sori are generally partial, and but rarely continued to the apex of the segments. The blotched and 3-coloured (green, white, and rose-purple) forms are not rare in the jungles; but the colours are generally incipient only, not as in

gardeners' varieties. Proliferous forms, as noticed by Sir W. J. Hooker, are not rare; they are not parasites.

Var. *major*. Larger in all its parts; ultimate segments of the lower pinnæ attaining 1 by $\frac{1}{2}$ in., very close together; sori continuous round the margin; lower pinnæ bipartite, or each with two descending pinnæ on the lower margin.

Sikkim to Khasia, frequent.—This appears to me to form a complete transition group connecting *P. quadriaurita* with *P. longipinnula*. I have sorted the large forms with the lower pinnæ undivided as *P. longipinnula*; but I see no difference really. In my large examples from Parasnath the ultimate segments from the lower pinnæ attain $1\frac{1}{2}$ in.; but the stipe is scabrid pubescent, the texture coriaceous reddish, the rhachis setigerous, the lower pinnæ bipartite, the ultimate segments close together; and I should call it *P. aspericaulis*, Wall., large.—Mettenius has named a Darjeeling specimen of this *P. Blumeana*, Agardh; other examples are named *P. repandula*, Link, as the form extends to Malaya and China. The true *P. Blumeana* is widely different.

Var. *khasiana*. Completely bipinnate; lowest pinna with 5 pinnæ on each side the rhachis, those on the upper margin 5–6 in., little smaller than those on the lower. (Pl. LIII.)

Khasia; alt. 3000 feet, *Da Silva*, in Wall. Cat. 106 partly, *C. B. Clarke*—A striking variety when seen alone, but graduates into the type.

Var. *Blumeana*, (sp.) Agardh, Recens. Gen. Pter. 22. Large; lowest pinnæ usually bipartite, lateral pinnæ sometimes with 50–60 segments; segments 1 by $\frac{1}{2}$ in., equally wide throughout or broader at the apex, not falcate, obtuse, rounded, entire or crenulate at the barren apex. (Pl. LV.)

Chittagong, *Hk. f. & T.*; *C. B. Clarke*.—Distrib. Tenasserim, Singapore, Java.—This is a well-marked form, and well circumscribed in area, and is, I think, better entitled to specific rank than *P. longipinnula* and several others. The ultimate segments are narrow, not approximate, spreading at right angles from the midrib, hardly falcate at the summit. The stipe is sometimes glabrous, sometimes scabrous pubescent; the rhachis is glabrous or setigerous above. The pinnæ are cut nearly to the rhachis, so that the lowest veins reach the margin above the sinus.—Both *P. longipinnula* and *P. quadriaurita*, var. *major*, have been distributed from Java wrongly marked *P. Blumeana*. The only specimens I can find of *P. quadriaurita* that show a tendency to approach *P. Blumeana* are some collected in the Concan by Mr. Law.

9. *P. GREVILLEANA*, Wall. Cat. 2680. Dimorphic; barren stipe shorter, winged towards its apex; barren frond pedately 5-fid, scarcely pinnate, margin spinulose-serrate; fertile frond with 5 pinnæ, the lower pair bipartite; veins exceedingly obscure.—Agardh, Recens. Gen. Pter. 23. (Pl. LIV.)

Sylhet, *Wallich*. Cachar; Shapoor, *R. L. Keenan*.

Mr. Keenan's excellent example has two barren and two fertile pinnæ attached to the rhizome. The ultimate segments in the barren fronds are approximate, sometimes

overlapping, but in the fertile somewhat distant. Fertile ultimate segments of the lower pinnules $\frac{1}{2}$ by $\frac{1}{3}$ in., linear-oblong, falcate, often broader upwards, obtuse, serrated at the barren apex. So far from sinking this species in *P. quadriaurita*, I doubt whether it is not more allied to *P. crenata*, with which Mettenius has indeed confounded it.

10. *P. SUBINDIVISA*, C. B. Clarke. Small, with 3 pinnæ; terminal pinnæ 6 in., with numerous segments; lateral pinnæ hardly longer than the segments of the terminal pinnæ or subobsolete.—*P. quadriaurita*, Hook. Sp. Fil. ii. 179, partly. (Pl. LVI. fig. 1.)

Bhotan, Griffith. Sikkim, alt. 1000 feet, C. B. Clarke.

This is the fern referred to by Sir W. J. Hooker, Sp. Fil. ii. 181, ll. 13, 14. It is not, however, allied to *P. Grevilleana*, or indeed to *P. subquinata*, as Sir W. J. H. supposed, but to *P. aspericaulis*, Wall., of which it may be an extreme form. The fern grows plentifully on wet rocks by the pony-path near the rivers Rungait and Teesta. The texture, shape of segments, sori, venation as in *P. quadriaurita*, Retz., form *aspericaulis*, Wall.

11. *P. LONGIPINNULA*, Wall. Cat. 108. Pinnæ 5 pairs, large, subremote, the lowest undivided, deeply pinnatifid, segments attaining $1\frac{1}{2}$ by $\frac{1}{2}$ in., falcate, not distant, their apex usually barren, not acuminate, slightly crenate or subentire; sori continued nearly to the apex of the segments; ultimate veins parallel, 1 millim. apart.—Hook. Sp. Fil. ii. 179, t. 134 A; Bedd. Ferns South. Ind. t. 43; Hk. & Baker, Syn. Fil. 158.

Sikkim, Khasia, Cachar, Sylhet, alt. 0–3000 feet.—Distrib. Travancore, Malay Peninsula and Islands.

The area of this fern is as doubtful as its delimitation from *P. quadriaurita*, var. *major*. The above description is from Wallich's original example, which recedes less from *P. quadriaurita* than do some others. A specimen from Cachar, by R. L. Keenan, has the ultimate segments (of the lateral pinnæ) $2\frac{1}{2}$ by $\frac{1}{2}$ in., with very parallel close veins.—The Sikkim examples referred here (collected by Sir J. D. Hooker and W. S. Atkinson) have the segments somewhat distant, the lowest pinnæ bipartite, and are doubly doubtful.

12. *P. EXCELSA*, Gaud. in Freycinet, Voy. 388. Large; pinnæ several, the lowest sometimes bipartite, pinnatifid nearly to the rhachis; segments $2-3\frac{1}{2}$ by $\frac{1}{2}-\frac{3}{4}$ in., elongate, narrowed upwards, falcate, often distant, their apex often barren serrulate; veins not rarely 3–4-branched.—Hook. Sp. Fil. ii. 183, t. 136; Bedd. Ferns Brit. Ind. t. 218; Hk. & Baker, Syn. Fil. 159. *P. terminalis*, Wall. Cat. 101; Agardh, Recens. Gen. Pter. 20.

Kumaon, Gurwhal, Dalhousie; alt. 4000–8000 feet, frequent. Sikkim; alt. 8000–9000 feet, Sir J. D. Hooker.—Distrib. Sandwich Islands.

This is separated with comparative ease by the large tapering falcate segments

serrated at their barren apices. The distribution is curious: the station of the Philippines, formerly attributed to this fern, is an error, that of Ava very doubtful. There are a few looped veins in some of the Himalayan examples, but very few.

13. *P. LONGIPES*, Don, Prodr. Fl. Nepal. 15, fide Baker. Frond subpedately divided into 7-5-3 pinnæ; pinnæ pinnate; secondary pinnæ pinnatifid nearly to the rhachis; segments $\frac{1}{2}$ by $\frac{1}{4}$ in.; apex obtuse, crenate-serrate.—Hk. & Baker, Syn. Fil. 161. *P. pellucens*, Agardh, Recens. Gen. Pter. 48; Hook. Sp. Fil. ii. 191; Bedd. Ferns South. Ind. t. 32. *P. Zollingeri*, Mett.; Miq. in Ann. Mus. Lugd. Bat. iv. 97. *P. brevisora*, Baker, in Hk. & Baker, Syn. Fil. 162. *Hypolepis pteridioides*, Hook. 2nd Cent. Ferns, t. 59.

Sikkim, Bhotan, Khasia; alt. 1000-5000 feet, frequent.—Distrib. Nilgherries, Ceylon, Pegu; scattered through Malaya, Guinea coast, Guatemala.

The fully-developed form of this with 5 (rarely 7) main divisions of the frond is easily distinguished from all the other Indian *Eupteris*. The lower pinnæ of the central pinna are (in the larger examples) imperfectly pinnate, with descending segments on the lower margins. Fragments of *P. longipes* are frequently mistaken for *P. quadriaurita*; their texture, however, is more shining, the veins much wider apart, the apex of the segments more serrate than in *P. quadriaurita*. The Guatemala plant might have been gathered in Sikkim, as might the examples of *P. brevisora*, which Mr. Baker has himself lately reduced in the Herbarium to *P. longipes*.—As regards the name *P. longipes*, from Don's description and the history of his plant, I should have thought *P. longipes*, Don, to have been *P. Wallichiana*; but as I do not possess the authentic example of Don for comparison I follow Mr. Baker. Blume (Enum. Pl. Jav. Fil. 212), has evidently otherwise understood *P. longipes*, Don.

Sect. II. *Pæsia*. Veins all free. Stipes distant, from a long-creeping rhizome. Involucre double.

14. *P. AQUILINA*, Linn. Sp. Pl. 1533, including *P. caudata*, Linn., same place; Hook. Sp. Fil. ii. 196; Hook. Brit. Ferns, t. 38; Bedd. Ferns South. Ind. t. 42; Milde, Fil. Europ. 45; Hk. & Baker, Syn. Fil. 162; Benth. Fl. Austral. vii. 731. *P. lorigera*, Wall. Cat. 103. *Pt. lanuginosa*, Wall. Cat. 98. *Pt. densa*, Wall. Cat. 99. *Pt. firma*, Wall. Cat. 100. *Pt. recurvata*, Wall. Cat. 113. *Pt. Wightiana*, Wall. Cat. 2178. *P. esculenta*, *lanigera*, and *revoluta*, Blume, Enum. Pl. Jav. Fl. 214.

From Kashmir to Assam and Khasia; alt. 2000-8000 feet; common.—Distrib. Deccan and Ceylon, Malaya. The whole world except the Arctic zones and temperate South America.

All the North-Indian examples belong to the var. *lanuginosa*, with ultimate segments approximate oblong, yellow-hairy beneath. Wallich's *P. lorigera* is a trifling variety, in which the ultimate segments in places are confluent. The true var. *esculenta*, with distant linear elongate segments (*P. semi-hastata*, Wall. Cat. 102), first appears at Moulmein, and becomes common thence southwards.

Sect. III. *Campteria*. Veins of the ultimate pinnæ inarching only near the base, at least occasionally.

15. *P. BIAURITA*, Linn. Sp. Pl. 1584. Frond once pinnate; pinnæ several, pinnatifid nearly to the midrib, the lowest nearly always bipartite, sometimes with 2-3 descending pinnæ from the lower margin.—Hk. & Grev. Ic. Fil. t. 142?; Hook. Sp. Fil. ii. 203; Hk. & Baker, Syn. Fil. 164. *P. nemoralis*, Willd.; Blume, Enum. Pl. Jav. Fil. 210; Wall. Cat. 106. *Campteria biaurita*, Hk. & Bauer, Gen. Fil. t. 65 A; Bedd. Ferns South. Ind. t. 44. *C. Bottleriana*, Presl, Tent. Pter. 147, t. 5. fig. 26.

From Gurwhal to Bhotan and Khasia, alt. 0-6000 feet; extending over the plains to Dacca, Pubna, &c. Parasnath, alt. 4400 feet.—Distrib. Deccan and Ceylon; Malay Peninsula and Islands, China; tropical Africa and America.

This fern differs from *P. quadriaurita* only in having some of the veins arched. Some fronds exhibit very few arched veins; and in fronds picked from the same rhizome some will exhibit a few arched veins, others none at all. Such plants are called *P. nemoralis*, Willd. (see Agardh, Recens. Gen. Pter. 25; Hk. & Bauer, Gen. Fil. t. 64 A). The form here considered as the type is the one parallel to that taken as the type form of *P. quadriaurita* above, and has the ultimate segments $\frac{1}{2}$ — $\frac{1}{3}$ in. long, and is the same figured by Beddome. It is not the commonest form in North India, where a larger form (corresponding closely to that called var. *major* of *P. quadriaurita* above) is more common, with ultimate segments $\frac{1}{2}$ —1 in. From this we pass without any good break into

Var. *geminata*, Wall. Cat. 2180. Ultimate segments $1\frac{1}{2}$ in., or even more.—Agardh, Recens. Gen. Pter. 31. *Campteria anamallayensis*, Bedd. Ferns South. Ind. t. 45.

This form is closely parallel to *P. longipinnula* above, and apparently equally entitled to specific rank; but the great mass of the North-Indian forms belong to the var. *major* intermediate between *P. biaurita* and *P. anamallayensis*, and, so far as I can see, bridge over the space between these two completely. The veins in highly developed examples of the var. *geminata* anastomose more than once, tending to sect. *Litobrochia*.—There remains the question whether the series of forms of *P. biaurita* is other than the parallel series above named *P. quadriaurita* (with varieties) and *P. longipinnula*. The two series extend over the same area. Against their being one, I can offer only three weak reasons (so far as the North-Indian plants are concerned):—1st. *P. biaurita* frequently produces a large bud, distant about $\frac{1}{3}$ the length of the frond from the top of the main rhachis; I have never seen such a bud in *P. quadriaurita*: 2nd. The larger forms of *P. quadriaurita* (viz. var. *major* and *P. longipinnula*) have the lowest pinnæ very generally undivided; the large forms of *P. biaurita* have the lowest pinnæ nearly always bipartite, and very frequently with several descending pinnæ: 3rd. The rhizome of *P. biaurita* has a tendency to creep and to form beds of the plant.

16. *P. WALLICHIANA*, Agardh, Recens. Gen. Pter. 69. Frond subpedately divided into 7-5-3 pinnæ; pinnæ pinnate; secondary pinnæ pinnatifid nearly to the rhachis;

segments $\frac{1}{2}$ by $\frac{1}{4}$ in., apex narrower, crenate.—Hook. Sp. Fil. ii. 206; Hk. & Baker, Syn. Fil. 165. *P. umbrosa*, Wall. Cat. 169, as to type sheet, not of R. Br. *Campteria Wallichiana*, Bedd. Ferns Brit. Ind. tt. 25, 217.

Himalaya, from Chumba to Bhotan; alt. 3000–8000 feet, very plentiful. Khasia; alt. 3000–6000 feet, common.—Distrib. Philippines, Java, Samoa.

The 5 pinnæ of this large fern stand out of one plane, so that the frond is in shape half a cup, which character is lost in drying. This fern may be a Campteroid form of *P. tripartita*, as Mr. Baker suggests, but it is not a Campteroid form of *P. longipes*; the habit and texture differ; the involucres are narrower, the segments and venation different.—A large quantity of the *P. umbrosa* in Wallich's own Herbarium is *P. biaurita*, Linn.

Var. *quadripinnata*. Main pinnæ tripinnate quadripinnatifid.

Darjeeling, C. B. Clarke.—My examples are in fruit.—Don (Prodr. Fl. Nepal. 15) divides his *Pteris* into two sections: *a.* 1-pinnate; *b.* 2-pinnate. He places *P. pectinata* in the 1-pinnate section, and repeats in the description that the frond was 1-pinnate, the pinnæ pinnatifid. Nevertheless Beddome follows Hooker in referring *P. pectinata*, Don, to *P. Wallichiana*; but I think Agardh must have been right in referring *P. pectinata*, Don, to *P. aspericaulis*, Wall., i. e. to *P. quadriaurita*, Retz., as above.—This question of the true place of *P. pectinata*, Don, carries another with it. Mr. Baker having allowed that *P. Wallichiana*, Agardh, is *P. pectinata*, Don, finds that *P. longipes*, Don, must have been *P. pellucens*, Agardh; but Mr. Edgeworth (in Herb.) takes *P. Wallichiana*, Agardh, to be the true *P. longipes*, Don, and, to me it seems, with much probability.

Sect. IV. *Doryopteris*. Veins copiously anastomosing, without free included veinlets. Fronds lobate pinnatifid, or scarcely 1-pinnate.

17. *P. LUDENS*, Wall. Cat. 88. Rhizome creeping, with linear adpressed scales, dark chestnut with whitened margins; stipes solitary, distant.—Hook. Sp. Fil. ii. 210; Hk. & Baker, Syn. Fil. 166. *P. multifida*, Roxb. in Calc. Journ. Nat. Hist. iv. 567, not of Poir. *Litobrochia pedata* and *L. ludens*, Bedd. Ferns Brit. Ind. tt. 26, 27, excluding synonyms.

Chittagong Hills, alt. 0–1000 feet, Roxburgh, C. B. Clarke. Orissa; Balasore Hills, Blanford.—Distrib. Malay Peninsula, Ava.

Stipe often with dusky subtomentose pubescence at base and apex, sometimes with a few scales. Frond glabrous beneath, with shining ribs.—Col. Beddome (in Brit. Ferns, Suppl. p. 8) proposes, as I understand him, to unite *P. ludens* and *P. palmata* under *P. pedata*, Linn.; but, as Sir W. J. Hooker pointed out (Syn. Fil. ii. 211), all the Burmese *P. ludens* has a long creeping rhizome, whereas (in the large Kew collection of *P. palmata* and *pedata*) the stipes are in every case closely tufted. As to Col. Beddome's fig. of *Litobrochia pedata*, it does not show the rhizome, but was taken from a Moulmein specimen, where *P. ludens* is common, *P. pedata* unknown.

Wallich's example from Dindighul marked *Pteris mysurensis*, referred by Hooker to

P. palmata, by Baker to *P. palmata*, consists of a fertile frond without the lower part of the stipe. It might be *P. ludens*; but the cutting is that of *P. palmata*, Hook. Garden Ferns, t. 22, or *P. pedata*, Hook. Fil. Exot. t. 84. There is in Wight's Peninsula Ind. Or. Herbarium a complete example, marked *Doryopteris sagittifolia*, which has the fronds closely tufted, and resembling in form *Pteris sagittifolia*, Raddi, Hook. Fil. Exot. t. 39; but the stipe is plentifully covered with long bright chestnut hairs, which extend to the ribs of the frond, and even over its surface beneath. In this scarcity of material from the Deccan the *P. pedata* of South India must remain obscure: *P. ludens*; of Chittagong, Burma, and Ava is completely known.

Sect. V. *Litobrochia*. Veins copiously anastomosing, with some free included veinlets. Fronds 2-pinnate or still further divided.

18. *P. INCISA*, Thunb. Prodr. Fl. Capens. 171; Blume, Enum. Pl. Jav. Fil. 212; Hook. Sp. Fil. ii. 230; Hk. & Baker, Syn. Fil. 172; Benth. Fl. Austral. vii. 732. *P. vespertilionis*, Labill. Nov. Holl. t. 245. *P. aurita*, Blume, Enum. Pl. Jav. Fil. 213; Mett. Fil. Hort. Bot. Lips. t. 14; Hook. Sp. Fil. ii. 231. *P. sinuata*, Wall. Cat. 84; Brack. Fil. of U.S. Explor. Voy. t. 14; Hook. Sp. Fil. ii. 232. *Litobrochia aurita*, Bedd. Ferns South. Ind. t. 221.

Sikkim, Bhotan, and Khasia; alt. 3000–6500 feet, frequent.—Distrib. Ceylon, Malaya; wide scattered in the tropics and southern subtropics of Asia, Australia, Polynesia, America, Africa.

[*P. marginata*, Bory, Hk. & Baker, Syn. Fil. 172, has attributed to it Sylhet as a locality, on the authority of Wallich, both by Hooker and Baker. There is no North-Indian specimen; and I believe the fern has not been collected north of Malacca and Ceylon. Wallich mixed his collections from remote localities under the same number, frequently before distribution; and he has in so many known instances thus mixed different species, that I am not at all disposed to accept the locality of Sylhet on his sole authority. He not improbably confused the species *P. marginata* and *P. Wallichiana* altogether. Wallich's example, supposed to be from Sylhet, is perhaps that on which Agardh founded his *P. revolvens* (Recens. Gen. Pter. 74).]

21. CERATOPTERIS, Brongn.

1. *C. THALICTROIDES*, Brongn.; Hk. & Bauer, Gen. Fil. t. 12; Hook. Sp. Fil. ii. 235; Wall. Cat. 83; Blume, Enum. Pl. Jav. Fil. 240; Bedd. Ferns South. Ind. t. 75; Hk. & Baker, Syn. Fil. 174; Benth. Fl. Austral. vii. 695. *Parkeria pteridioides*, Hook. Exot. Flora, tt. 147, 231; Hk. & Grev. Ic. Fil. t. 97; Hk. & Bauer, Gen. Fil. t. 50. *Pteris succulenta*, Roxb. in Calc. Journ. Nat. Hist. iv. 508. *Acrostichum thalictroides*, Linn. Sp. Pl. 1527.

From the Punjab to Bhotan and Chittagong; alt. 0–3000 feet, common.—Distrib. Deccan and Ceylon; Malay Peninsula; in the tropics of the whole world.

In rice-swamps, floating; but much more commonly erect, tufted, in ditches, or even

in dry spots during the rains. The floating and the erect forms both produce their barren and fertile fronds. In ditches the rhizome is somewhat creeping and stout.

22. LOMARIA, Willd.

[Beddome (Brit. Ferns, Suppl. p. 9) states that *Lomaria Patersoni*, Spreng., Hk. & Baker, Syn. Fil. 174, is generally distributed in India; but I never heard of its being collected in North India, and in the Kew Herbarium there is no specimen north of the Nilgherries.]

Sect. *Plagiogyria*. Base of stipe dilated, triquetrous. Capsules with an oblique ring.

1. *L. ADNATA*, Blume, Enum. Pl. Jav. Fil. 205. More than half the pinnæ of the barren frond sessile adnate.—Hook. Sp. Fil. iii. 19, t. 147; Hk. & Baker, Syn. Fil. 182. *L. euphlebia*, Hook. 2nd Cent. Ferns, t. 89, not of Kunze. *Plagiogyria adnata*, Bedd. Ferns Brit. Ind. t. 51. *P. scandens*?, Mett. Farn. Plagiog. 9.

Khasia; alt. 4000–5000 feet, plentiful.—Distrib. Java, Japan.

Pinnæ of the barren frond usually approximate, often all adnate, so that the frond is pinnatifid, scarcely pinnate; pinnæ often falcate, simply serrate, or nearly entire in their lower portion, varying from scarcely acute to caudate.—The Indian *L. adnata* is easily separated from *L. euphlebia*, but the Japan critical examples unite the two species, so that I cannot name them. The typical *L. adnata* is sent from Japan; but Maximowicz names the whole series *L. euphlebia*, Mett.—As to the name *L. adnata*, Blume, the only example from Java so named is a portion of a fertile frond quite impossible of determination. The Khasi plant may yet turn out something quite different from *L. adnata*.

2. *L. GLAUCA*, Blume, Enum. Pl. Jav. Fil. 204. Lower pinnæ of the barren frond white-glaucous beneath, minutely serrate in their lower half, suddenly truncate to a very short stalk.—Kunze, 2nd Suppl. to Schkuhr, t. 138; Hook. Sp. Fil. iii. 22; Hk. & Baker, Syn. Fil. 182. *Plagiogyria glauca*, Mett. Farn. Plagiog. 9; Bedd. Ferns Brit. Ind. t. 90.

Khasia, alt. 4000–5000 feet; Moflong Wood, *Hk. f. & T.*; Vale of Rocks, Upper Kalapani, Sohra Reen (Surareem), *C. B. Clarke*.—Distrib. Java.

I think only a var. of *L. pycnophylla*, powdered beneath. There is no difference between the two in the degree of serration and acumination of the points of the pinnæ, or in the frequency of the presence of a gland at their base. F. Henderson observes that the lower pinnæ, not the mere auricles, are distant. Some of the Java *L. glauca* are much larger than the Khasia.

3. *L. PYCNOPHYLLA*, Kunze, in Bot. Zeit. 1848, 143. Lower pinnæ of the barren frond green beneath, minutely serrate in their lower half, suddenly truncate to a very short stalk.—Hook. Sp. Fil. iii. 21, t. 148; Hk. & Baker, Syn. Fil. 183. *L. callosa*,

Fée, Gen. Fil. 70. *Plagiogyria pycnophylla*, Mett. Farn. Plagiog. 8; Bedd. Ferns Brit. Ind. t. 52. *Acrostichum triquetrum*, Wall. Cat. 23, partly. *Stenochlæna* ? *pycnophylla*, Presl, Epimel. Bot. 165.

Nepaul to Bhotan, alt. 6000–11,000 feet; one of the commonest ferns at 7000–8000 feet. Khasia; alt. 4000–6000 feet, common.—Distrib. Malay Peninsula and Java.

I have collected a frond of this having the lower halves of the pinnæ barren, their upper halves fertile. It is a high-level fern in Sikkim, covering with its strong tufts large areas in the upper dripping forests. I have collected it at 11,000 feet near Jongri under Kinchinjunga.

4. *L. EUPHLEBIA*, Kunze, in Bot. Zeit. 1848, 521. More than half the pinnæ of the barren frond stalked cuneate at base, scarcely serrulate in their lower half,—Kunze, 2nd Suppl. to Schkuhr, t. 125; Hook. Sp. Fil. iii. 20; Hk. & Baker, Syn. Fil. 183, exclud. synon.; Hook. 2nd Cent. Ferns, t. 89; Benth. Fl. Austral. vii. 738, excl. the Chinese and Japanese var.. *L. articulata*, F. Muell. Fragm. v. 187. *Plagiogyria triquetra*, Mett. Farn. Plagiog. 10. *P. euphlebia*, Mett. l. c.; Bedd. Ferns Brit. Ind. t. 165. *Acrostichum triquetrum*, Wall. Cat. 23, type sheet. *Olfersia triquetra*, Presl, Tent. Pter. 235. *Stenochlæna triquetra*, J. Sm. in Hook. Journ. Bot. 1842, 149.

Nepaul, *Wallich*. Khasia; alt. 4000–6000 feet, plentiful.—Distrib. Japan, North Australia.

There are only 6 sheets of this in all, except from Khasia, whence there is abundance. The numerous examples sent from Japan by Maximowicz are all *L. adnata*, except two, that are *L. semicordata*. As stated under *L. adnata* above, *L. euphlebia* as to the Indian species is well separated. Usually only a very few of the uppermost pinnæ of the barren frond are adnate; the lowest pinnæ are distinctly stalked, often shorter than some above, and distant.

23. BLECHNUM, Linn.

1. *B. CARTILAGINEUM*, Swartz, Syn. Fil. 114 & 312. Frond pinnatifid, but pinnate towards the base, margin serrulate; the lowest pinnæ linear, distant, narrower than those above, but not reduced to mere auricles.—Mett. Fil. Hort. Lips. 63, t. 4 figs. 1–5; Hook. Sp. Fil. iii. 43; Hk. & Baker, Syn. Fil. 184; Benth. Fl. Austral. vii. 738; Luerssen, Fil. Graeff. 132.

Mishmee, *Griffith*.—Distrib. Luzon, Australia.

I remove (without any hesitation) Griffith's solitary example from *B. nitidum* (where Hk. & Baker have left it) to *B. cartilagineum*. Hooker's *B. nitidum* is founded on and figured from Tweedie's solitary Brazilian example; this is copied by Bedd. Ferns Brit. Ind. t. 49. The species hereabouts are critical, but Griffith's specimen agrees *exactly* with the Australian plant, and not with the American; it has the rachis beneath puberulo-subpubescent, a character often seen in the Australian examples, never in the American *B. nitidum* or *B. brasiliense*. It is to be noted that Presl's *B. nitidum* (established

in Rel. Hænk. i. 49) is defined to have the lowest pinnæ subrotund; it is therefore *B. brasiliense*, Desv., as Presl stated, and not Hooker's *B. nitidum* (assuming these two to differ). Further, *B. nitidum*, var. *contractum*, Hook. Sp. Fil. iii. t. 156, founded on Cuming's Luzon No. 164 (which number Presl quotes, Epimel. Bot. 116, as his *Blechnopsis nitida*), is merely *B. cartilagineum*, Swartz, with the lower halves of the pinnæ barren, the upper portions fertile. Compare the similar form noted above under *Lomaria pycnophylla*. Lastly, Presl says his *Blechnopsis nitida* is the same as his *Blechnum nitidum*. In the extreme confusion of these leading synonyms it is not worth while to speculate what *B. elongatum*, Gaud., and the other doubtful synonyms may have been. What I maintain here is that Griffith's Mishmee plant, ἀπαξ λεγ., is most accurately represented by Mettenius (Fil. Hort. Lips. t. 5), and is not represented by Hooker (Sp. Fil. t. 155).

[*B. serrulatum*, Richd. (= *B. striatum*, R. Br.), is said by Hk. & Baker, Syn. Fil. 186, to have been collected by Griffith in Mishmee. The authority for this is Hooker, Sp. Fil. iii. 55, who gives, under the localities for *B. striatum*, "Mishmee, in marshes, Griffith (inscribed *Blechnum pteridioides*)."] In the Herbarium I find Griffith's plant; the ticket, in his handwriting, runs "*Blechnum pteridioides*, in marshes, Ager Punnus," and on the sheet in Sir W. J. Hooker's writing is "Mishmee, Griffith." The Ager Punnus is near Malacca; and Dr. T. Thomson has added at some time the explanation Malacca on Griffith's ticket. There remains, therefore, no ground for supposing *B. serrulatum* a North-Indian Fern. It appears to be not uncommon at Malacca.]

2. *B. ORIENTALE*, Linn. Sp. Pl. 1535. Frond pinnate; pinnæ numerous, linear, margin entire; veins close, parallel, free or nearly so.—Schkuhr, Crypt. t. 109; Blume, Enum. Pl. Jav. Fil. 197; Hook. Fil. Exot. t. 77; Wall. Cat. 57; Hook. Sp. Fil. iii. 52; Carr. in Fl. Viti. 352; Bedd. Ferns South. Ind. t. 29; Hk. & Baker, Syn. Fil. 186; Benth. Fl. Austral. vii. 739. *B. pyrophyllum*, Blume, Enum. Pl. Jav. Fil. 197. *B. moluccanum*, Roxb. in Calc. Journ. Nat. Hist. iv. 502. *B. imbricatum*, Blume, Enum. Pl. Jav. Fil. 198. *Blechnopsis Cumingiana*, *latifolia*, *salicifolia*, *elongata*, *pyrophila*, *stenophylla*, Presl, Epimel. Bot. 116, 117.

Throughout North and East Bengal near the hills, and ascending the Khasi Hills to 4000 feet alt., abundant. Nepaul, Wallich.—Distrib. Deccan and Ceylon, Malay Peninsula and Islands, China and Polynesia, Queensland.

This varies greatly in size both in the plains and in the hills at 4000 feet alt.. I have collected it with pinnæ 4 in. long, and again with pinnæ 15–18 in. long. This last form is very difficult to separate from *B. Finlaysonianum*, Wall.; Hk. and Grev. Ic. Fil. t. 225 (as Mr. Baker has remarked); but all the Bengal *B. orientale* is, I think, one species. The sheet of *B. Finlaysonianum*, Wall. Cat. 2172, is blank (but ticketed) in Wallich's own type set; while the plant *B. Finlaysonianum* from Penang is mixed with *B. orientale*, and numbered 57 in that type set.

3. *B. MELANOPUS*, Hook. Sp. Fil. iii. 64, t. 161. Frond pinnatifid, scarcely pinnate lanceolate, narrowed at either end; pinnæ numerous, very close together, falcate,

margins entire, veins copiously reticulated.—Hk. & Baker, Syn. Fil. 186. *Blechnidium melanopus*, Bedd. Ferns Brit. Ind. t. 50.

Khasia, Simons, Dodgson.

Dodgson's specimens are good, but do not show the rhizome.

24. WOODWARDIA, Smith.

1. *W. RADICANS*, Smith; Hook. Sp. Fil. iii. 66; Wall. Cat. 58; Hk. & Bauer, Gen. Fil. t. 17; Fée, Gen. Fil. t. 17 A; Bedd. Ferns Brit. Ind. t. 88; Milde, Fil. Europ. 47; Hk. & Baker, Syn. Fil. 188. *W. stans*, Swartz, Syn. Fil. 117; Schkuhr, Crypt. t. 113. *W. auriculata*, Blume, Enum. Pl. Jav. Fil. 196.

Himalaya; from Kashmir to Bhotan, alt. 3000–8000 feet, frequent. Khasia; alt. 4000–5000 feet, not plentiful.—Distrib. Java; South Europe and Macaronesia; California and Mexico.

The Indian form is erect, and not so fine as the pendent plant in Madeira and the Canaries.

25. ASPLENIUM, Linn.

Subgenus I. *Thamnopteris*, Presl, = *Neottopteris*, J. Smith. A subgenus containing probably but one good species.

1. *A. NIDUS*, Linn. Sp. Pl. 1537. Fronds 1½–6 feet.—Blume, Enum. Pl. Jav. Fil. 173; Wall. Cat. 198; Roxb. in Calc. Journ. Nat. Hist. iv. 496; Hook. Sp. Fil. iii. 77; Bot. Mag. t. 3101; Mett. Farngatt. Aspl. 85; Carr. in Fl. Viti. 353; Hk. & Baker, Syn. Fil. 190; Luerssen, Fil. Graeff. 146; Benth. Fl. Austral. vii. 744. *A. musæfolium*, Mett. Farngatt. Aspl. 86; Hook. Sp. Fil. iii. 78. *A. phyllitidis*, Don, Prodr. Fl. Nep. 7; Mett. Farngatt. Aspl. 87; Hook. Sp. Fil. iii. 87. *A. simplex*, Blume, Enum. Pl. Jav. Fil. 174; Mett. Farngatt. Aspl. 86. *A. australasicum*, Hook. Fil. Exot. t. 88; Mett. Farngatt. Aspl. 85; Hook. Sp. Fil. iii. 79. *Thamnopteris nidus*, Presl, Epimel. 68; Bedd. Ferns Brit. Ind. t. 197. *T. phyllitidis*, Presl, Epimel. 68; (= *nidus*, var.) Bedd. Ferns South. Ind. t. 123.

From Nepaul to Assam and Chittagong, alt. 500–5000 feet; common in the hills.—Distrib. Malabar and Ceylon, Malay Peninsula and Islands; extending throughout moister South-east Asia from Mauritius to Polynesia.

Frond varying (in the North-Indian examples) from ¾ to 5 in. in width, tapering to the very base, not tapering acuminate or subobtusate at the apex. Sori extending less than ¼ (or nearly the whole) of the breadth of the frond, ascending or subpatent from the midrib, never distant in the North-Indian plant. Texture thin or thick. Midrib more or less prominent towards the base of the frond. In a word, none of the characters proposed as specific in *Thamnopteris* are constant, nor do any two invariably go together.

Var. *Simonsiana*, (sp.) Hook. Sp. Fil. iii. 81. Frond 9–18 in.—Hook. Ic. Pl. t. 925; Mett.

Farngatt. Aspl. 86; Hk. & Baker, Syn. Fil. 121. *Thamnopteris Simonsiana*, Bedd. Ferns Brit. Ind. t. 248.

Khasia and Jaintea, alt. 0-4500 feet, common. Chittagong, C. B. Clarke.—Beddome also finds it in Malabar; nor do I doubt that he has got the true plant.—*A. Grevillei*, Wall. Cat. 1036; Hk. & Grev. Ic. Fil. t. 228; *Thamnopteris Grevillei*, Bedd. Ferns Brit. Ind. t. 66, a Tavoy plant, somewhat recedes from *A. nidus* type by its strongly spathulate fronds; and *A. pachyphyllum*, Kunze in Bot. Zeit. vi. 146, differs in its texture and remoter sori.

Subgenus II. *Euasplenium*. Veins free, simple or branched. Involucre linear, dehiscing along the outer edge, none placed back to back. Scales from the base of the stipe fenestrate by rich-brown transverse cells.

* *Fronds undivided*.

2. *A. ENSIFORME*, Wall. Cat. 200. Frond linear, entire, tapering very gradually downwards, with hardly any stipe; sori much sloping upwards, ultimately very thick.—Hk. & Grev. Ic. Fil. t. 71; Mett. Farngatt. Aspl. 145; Hook. Sp. Fil. iii. 89; Hk. & Baker, Syn. Fil. 191. *A. stenophyllum*, Bedd. Ferns Brit. Ind. t. 147.

Himalaya; from Gurwhal to Bhotan, alt. 4000-9000 feet; common in Sikkim.

Varies in size from 3 to 24 in. Texture thick, margin much reflexed in drying; stains the drying-paper a madder-rose, whence known in Herb. as *A. tingens*, Don, but where Don so named it cannot be discovered.—A Ceylon plant (var. *australis*) figured in Bedd. Ferns South. Ind. t. 125, is usually referred as a geographical var. to *A. ensiforme*; it is more definitely narrowed into the stipe, the frond is broader and thinner, the sori more patent, less thick when ripe. A similar plant is communicated by Mr. Parish from Moulmein.—The American *A. coriaceum*, Fée, recedes a long way by its definite stipe, &c.

3. *A. GRIFFITHIANUM*, Hook. Sp. Fl. iii. 87. Frond linear, undulate, crenate, narrowed very gradually downwards, with hardly any stipe.—Hook. Ic. Pl. t. 928; Mett. Farngatt. Aspl. 89; Bedd. Ferns Brit. Ind. t. 58; Hk. & Baker, Syn. Fil. 193.

Sikkim; below Darjeeling, scarce; at 4000 feet alt., W. S. Atkinson. Mishmee, Griffith. Khasia; alt. 4000-5000 feet, F. Henderson.

Length 4-12 in.—A fern collected in the South Malay Peninsula differs by having a long stipe. It seems related to *A. Griffithianum*, exactly as var. *australis* to its type *A. ensiforme*.

4. *A. ALTERNANS*, Wall. Cat. 221. Frond narrowly oblong, deeply pinnatifid.—Hook. Sp. Fil. iii. 92, Garden Ferns, t. 38; Bedd. Ferns Brit. Ind. t. 59; Hk. & Baker, Syn. Fil. 194. *A. Dalhousiae*, Hook. Ic. Pl. t. 105; Mett. Farngatt. Aspl. 147.

North-west Himalaya, alt. 3000-9000 feet, very common; extending to the west frontier of Kashmir, and eastwards to Sikkim, where it is rare.—Distrib. Abyssinia.

** *Fronds once pinnate ; pinnae sometimes lobed, but not again pinnate.*

† *Pinnæ very small, obtuse.*

5. *A. VIRIDE*, Huds. Fl. Ang. 385. Rhachis green ; pinnæ $\frac{1}{8}$ – $\frac{1}{4}$ in., ovate or elliptic, on very short green or white petioles.—Schk. Krypt. Gew. t. 73 ; Engl. Bot. t. 2257 ; Hook. Brit. Ferns, t. 30 ; Mett. Farngatt. Aspl. 139 ; Hook. Sp. Fil. iii. 144 ; Bedd. Ferns Brit. Ind. t. 64 ; Milde, Fil. Europ. 60 ; Hk. & Baker, Syn. Fil. 195.

Kashmir, alt. 12,000–13,000 feet ; Gulmurg, *H. C. Levinge* ; Tilail, *C. B. Clarke*.—Distrib. Europe, Asia, and North America, in Arctic and Alpine temperate regions.

Stipe often brown or blackish.—*A. Trichomanes*, in India, has been frequently mistaken for this plant ; and I find no example of it from India in the Kew collection ; but Col. Beddome appears to have early received it from Kumaon.

6. *A. TRICHOMANES*, Linn. Sp. Fil. 1540 a. Rhachis chestnut or black ; pinnæ $\frac{1}{8}$ – $\frac{1}{2}$ in., ovate or elliptic, subsessile, lower margin not excavated nor concave, upper margin not acutely auricled near the base ; sori short, mostly in two rows.—Eng. Bot. t. 576 ; Schk. Krypt. Gew. t. 74 ; Wall. Cat. 193 ; Hook. Sp. Fil. iii. 136 ; Brit. Ferns, t. 29 ; Mett. Farngatt. Aspl. 138 ; Milde, Fil. Europ. 63 ; Bedd. Ferns South. Ind. t. 147 ; Hk. & Baker, Syn. Fil. 196 ; Benth. Fl. Austral. vii. 745. *A. anceps*, Solander ; Hk. & Grev. Ic. t. 195. *A. minus* and *pusillum*, Blume, Enum. Pl. Jav. Fil. 183. *A. castaneum*, Schlecht. ; Mett. Farngatt. Aspl. 137. *A. densum*, Brack. U. S. Explor. Ferns, t. 20.

From Kashmir to Kumaon, alt. 5000–10,000 feet ; plentiful from Chumba westward.—Distrib. Nilgherries ; Java ; Japan. In all the four quarters of the world, Australia and Polynesia, less common in the southern hemisphere.

Usually smaller than *A. normale*, but very difficult to separate therefrom. In North India they are here separated geographically : the large Kashmir form is exactly *A. Trichomanes*, var. *anceps* ; the small Sikkim plant I call *A. normale*, var. *minor*. Mr. Baker, with hesitation, agrees.

7. *A. NORMALE*, Don, Prodr. Fl. Nep. 7. Rhachis chestnut or brown ; pinnæ $\frac{1}{8}$ –1 in., elliptic or oblong, subsessile, lower margin often concave, upper acutely auricled near the base ; sori in two rows, or in one row, or one to each pinna.—Hk. & Baker, Syn. Fil. 197. *A. multijugum*, Wall. Cat. 207 ; Hook. Sp. Fil. iii. 139, t. 188 ; Mett. Farngatt. Aspl. 135 ; Bedd. Ferns South. Ind. t. 133. *A. multicaule*, Wall. Cat. 208. *A. opacum*, Kunze ; Mett. Farngatt. Aspl. 135 ; Hook. Sp. Fil. iii. t. 188. fig. β .

From Nepaul to Bhotan ; alt. 4000–8000 feet, common. Khasia ; alt. 3000–5000 feet, very common.—Distrib. Nilgherries, Ceylon, Canton.

If this is difficult to separate from *A. Trichomanes* on the one hand, it is far more difficult to separate from *A. monanthemum*, Linn., on the other. The Khasia examples have frequently monosorous pinnæ greatly excavated on the lower margin, and seem to me more like the typical *A. monanthemum* than the typical *A. normale*. The North-

India forms vary from 4 to 16 in. long; the Nilgherry var. *A. opacum* has still larger pinnae; indeed the well-developed *A. normale* is larger than ordinary *A. monanthemum*.—Again, *A. paeoninum*, Brack. U. S. Explor. Ferns, t. 20, has been reduced to *A. erectum*, but perhaps is nearer *A. normale*, var. *opacum*.—Granting that *A. normale* is a distinct species from *A. monanthemum*, it may be fairly argued that *A. monanthemum* is a North-Indian fern.

*** *Fronde flabellately cut into 1-3 linear pinnae.*

8. *A. SEPTENTRIONALE*, Hoffm. Fl. Germ. Comp.! Crypt. 12. Frond glabrous.—Schk. Krypt. Gew. t. 65; Engl. Bot. t. 1017; Hook. Sp. Fil. iii. 174, Brit. Ferns, t. 26; Mett. Farngatt. Aspl. 141; Fil. Hort. Lips. t. 13. fig. 21; Milde, Fil. Europ. 81; Hk. & Baker, Syn. Fil. 198. *Acrostichum septentrionale*, Linn. Sp. Pl. 1524.

Kashmir; alt. 9000-12000 feet, frequent. Gurwhal; alt. 8000 feet, *Strachey & Winterbottom*.—Distrib. Arctic and Temperate Alpine Europe, Asia, and America.

† *Pinnae numerous, usually $\frac{1}{2}$ in. or more, oblong or oblong-linear.*

¶ *Pinnae not very unequal at the base on either side the midrib.*

9. *A. LONGISSIMUM*, Blume, Enum. Pl. Jav. Fil. 178. Frond 2-8 feet; rhachis with ovate fimbriate scales, producing a bud and rooting near the apex; pinnae 2-4½ in., glabrous.—Mett. Farngatt. Aspl. 147; Hook. Sp. Fil. iii. 149, t. 190; Bedd. Ferns Brit. Ind. 63; Hk. & Baker, Syn. Fil. 199. *A. flagelliferum*, Wall. Cat. 219.

Sylhet station, *Wallich*; abundant, *C. B. Clarke*.—Distrib. Malay Peninsula, from Moulmein southwards, and Islands; Mauritius.

Rhizome very shortly creeping; stipe with narrow lanceolate subentire light brown scales near the base. Fronds (at Sylhet) usually 6-8 feet, climbing over the swamp-jungle, repeatedly proliferous, linear; scales of the rhachis ovate, of finely reticulated subfenestrate tissue, with pectinate margin. Pinnae oblong-linear, $\frac{1}{4}$ - $\frac{1}{3}$ in. broad, rhomboidal, not cuneate at the base, serrate, scarcely lobed or subpinnatifid; sori oblique, linear, in two rows, usually towards the centre of the pinnae, not extending to the margin. Distinct from all other North-Indian *Aspleniums* by its great size.—*Wallich* wrote *Sylhet* as the locality where he obtained this fern; I believe him. Over his sheets of specimens so marked (both at Kew and Calcutta) some miscreant has written *Singapore* and scratched out *Sylhet*. The fern abounds all round Sylhet station with its teelas now.

10. *A. LONGIFOLIUM*, Don, Prodr. Fl. Nep. 7. Stipes crowded on a decumbent caudex; frond 6-12 in., long-lanceolate, often almost coriaceous, in texture glabrous; pinnae 2-3 in., falcate, auricled on the upper margin at the base, sharply finely serrate, usually subentire or slightly lobed, the lowest pinnae (in Edgeworth's fine specimens) deeply lobed sub-2-pinnate.—Hk. & Baker, Syn. Fil. 234. *A. lobulosum*, Wall. Cat. 210; Mett. Farngatt. Aspl. 163; Hook. Sp. Fil. iii. 252. *Diplazium longifolium*, Moore, Ind. Fil. ii. 141. *D. lobulosum*, Bedd. Ferns Brit. Ind. t. 247.

Nepaul and Kumaon, alt. 6000-8000 feet; very restricted in area and nowhere common.

There is no instance in the Kew Herbarium where capsules are produced on both sides of a nerve. The involucre is large, thin, early dehiscent from the outer edge, often becomes doubled or folded, and generally becomes totally reflexed, so that the sori are seen one side of the vein, the involucre the other. H. C. Levinge notes that *A. erectum*, Bory, var. *trapeziforme*, Bedd. Ferns South. Ind. t. 134, hardly differs; it is rather less acutely serrate, and the lower margin of the pinnæ is more cut away at the base: I see very little difference. Beddome's figure is exceedingly good, and his magnified view of the sori also excellent; the lowest involucre is shown across the vein (as it usually appears); but Col. Beddome shows the capsules peeping from under the involucre on both sides of the nerve, which I have never been able to see.—*A. Wichura*, Mett. in Ann. Mus. Lugd. Bat. ii. 237, is doubtfully distinct, by the more creeping rhizome with distant stipes. It is a *Euasplenium*, and (except as to the rhizome) identical with *A. longifolium*.

¶¶ *Pinnæ unequal at base, the lower margin narrowed at the base, or more or less cut away.*

11. *A. CRINICAULE*, Hance, in Ann. Sc. Nat. sér. 5, v. 254. Frond linear, 1-3 feet; rhachis with lanceolate-setaceous scales; pinnæ 1-1½ in., lanceolate subfalcate, unequally cuneate at the base, serrate or pinnatifid less than halfway to the midrib; sori linear, oblique on either side the midrib.—Hk. & Baker, Syn. Fil. (ed. 2) 208. *A. Hancei*, Hk. & Baker, Syn. Fil. 208; Kuhn, in Bot. Zeit. 1869, 130; Hance, in Journ. Linn. Soc. xiii. 139. *A. Beddomei*, Mett. in Linnæa, xxxvi. 93. *A. falcatum*, Bedd. Ferns South. Ind. t. 141, not of Lamk.

Sikkim, *Elwes*, Capt. *Dodgson*. Jaintea Hills, alt. 4000-5000 feet; Jowye, Raliang, &c., *C. B. Clarke*.—Distrib. Deccar Mts., China.

Tufted, usually much larger than *A. planicaule*. Out of the Indian material now accumulated at Kew it is possible to match exactly Hance's type specimen of his *A. crinicaule*. Hance's smaller specimens with very entire pinnæ cannot as yet be matched from India. Some of *C. B. Clarke*'s Jaintea specimens have the pinnæ deeply pinnatifid, and should perhaps be referred to *A. planicaule*.—The rhachis has numerous lanceolate setaceous scales, and often also ovate fimbriate scales.

12. *A. FALCATUM*, Lamk. Encycl. ii. 306. Rhizome tufted; frond linear-lanceolate; rhachis glabrous or very sparingly scaly; pinnæ petioled, 2-4 in., lanceolate caudate serrate; nerves close, flabellulate; sori linear, flabellulate nearly to the margin.—Wall. Cat. 225; Mett. Farngatt. Aspl. 156; Brack. U. S. Explor. Ferns, t. 22. fig. 1; Hook. Sp. Fil. iii. 160; Carr. in Fl. Viti. 354; Hk. & Baker, Syn. Fil. 208; Benth. Fl. Austral. vii. 746; Cat. Ferns Ceylon, by G. W., 4. *A. polyodon*, Forst. Fl. Austral. Prodr. 80; Mett. Farngatt. Aspl. 156. *A. urophyllum*, Wall. Cat. 192. *A. Tavoyanum*, Wall. Cat. 1035. *A. contiguum*, Bedd. Ferns South. Ind. t. 140.—Burm. Thes. Zeyl. t. 43.

Soonderbun; near Koolna in Jessore, *C. B. Clarke*, once collected.—Distrib. Malay Peninsula, from Moulmein southwards; Deccan and Ceylon; South Africa and Islands; Australia and Polynesia, a common fern.

Scales at the base of the stipe lanceolate caudate, blackish, entire or slightly ciliate. Frond 6-24 in.; pinnæ often few, distant, sometimes numerous, rarely crowded; in the type $\frac{1}{2}$ - $\frac{1}{2}$ in. wide, toothed subacutely, but varying more lobed, sometimes pinatifid nearly to the midrib; texture somewhat coriaceous. There should perhaps be reduced here as varieties the two following; but neither of these forms has been hitherto collected in North India.

Var. ? *caudatum*, (sp.) Forst. Fl. Austral. Prodr. 80. Sori shorter, in two very oblique rows close to the midrib of the pinnæ.—Schk. Krypt. Gew. t. 77; Blume, Enum. Pl. Jav. Fil. 184; Hook. Sp. Fil. iii. 152; Bedd. Ferns South. Ind. t. 143; Hk. & Baker, Syn. Fil. 209. *A. multisectum*, Blume, Enum. Pl. Jav. Fil. 185.

South India, Malay Peninsula and Islands, Australia (not in Hindoosthan, as stated in Hk. & Baker, Syn. Fil.).

Var. ? *macrophyllum*, (sp.) Swartz; Hook. Sp. Fil. iii. 158, tt. 196, 197. Pinnæ larger, often much broader, sometimes 1-1 $\frac{1}{2}$ in. broad.—Bedd. Ferns South. Ind. t. 142; Hk. & Baker, Syn. Fil. 209. *A. Finlaysonianum*, Wall. Cat. 2682, not of Mett. *A. coriaceum*, Roxb. in Calc. Journ. Nat. Hist. iv. 497.

South Malay Peninsula and Islands. Not in Hindoosthan nor Ceylon, as stated in Hk. & Baker, Syn. Fil.: see Cat. Ferns Ceylon, by G. W., p. 4.—As we proceed south down the Malay Peninsula there seems a complete series from *A. Tavoyanum*, Wall. (a small few-pinna form of *A. falcatum* type), through *A. urophyllum*, Wall., to *A. Finlaysonianum*, Wall.

13. *A. GARDNERI*, Hk. & Baker, Syn. Fil. (2nd ed.) 485. Rhizome shortly creeping; frond linear-lanceolate; rhachis with lanceolate setaceous scales; pinnæ 1-8 in., lanceolate subacute, crenate or obtusely toothed; nerves wide apart, flabellate; sori linear, divergent, extending nearly to the margin.—Bedd. Ferns Brit. Ind. (Suppl.) t. 355; Cat. Ferns Ceylon, by G. W., 4. *A. macrophyllum*, Thwaites, Enum. 384, not of Swartz.

Khasia Mts.; Umwai, alt. 3000 feet, *C. B. Clarke*, several times collected.—Distrib. Ceylon, Sumatra.

Frond 6-24 in., often rooting from a subterminal bud, both in the Khasi and in the Cinghalese specimens. Nerves nearly twice as wide apart as in *A. falcatum* and its varieties. The Khasi examples agree very closely with the Cinghalese.—A single barren frond has been communicated by R. L. Keenan from Cachar, which Mr. Baker will hazard no name for: the frond is linear, 20 in., tapering at both ends, proliferous at the summit; rhachis polished, texture nearly of *A. heterocarpum*; pinnæ from a rhomboidal base, in form nearly as those of *A. crinicaule*, Hance. It probably indicates a new species.

14. *A. UNILATERALE*, Lamk. Encycl. ii. 305. Frond linear, glabrous, membranous; pinnae numerous, oblong, somewhat falcate, the lower margin completely cut away near the base, toothed upwards.—*A. dissectum*, Smith, Pl. Ic. hact. ined. t. 72; Hk. & Grev. Ic. Fil. t. 114; Mett. Farngatt. Aspl. 182; Hook. Sp. Fil. iii. 180; Carr. in Fl. Wilt. 354; Bedd. Ferns South. Ind. t. 132, Ferns Brit. Ind. tt. 354, 357; Hk. & Baker, Syn. Fil. 210. *A. abasicum*, *perphyrocaulon*, *erythrocaulon*, *erectodentatum*, Blume, Enum. Pl. Jav. Fil. 182, 183. *A. trapeziforme*, Wall. Cat. 66; Hook. in Calc. Journ. Nat. Hist. iv. 497; Bedd. Ferns South. Ind. t. 134. *A. latum*, Wall. Cat. 209, not of Swartz. *A. decurrens*, Wall. Cat. 190. *A. cristatum*, Wall. Cat. 211. *A. amœnum*, Presl; Mett. Farngatt. Aspl. 131. *A. serræforme*, Mett. Farngatt. Aspl. 119, t. 4. fig. 13. *A. emarginato-dentatum*, Zenker; Mett. Farngatt. Aspl. 132.

Himalaya, alt. 1000–9000 feet; from Chumba to Bhotan; common from Nepaul eastward. Khasia, alt. 1000–5000 feet, common. Chittagong.—Distrib. Nilgherries and Ceylon, Malay Peninsula and Islands, Polynesia, Japan; Tropical Africa.

Rhizome slender, creeping. Pinnae in the large forms (*A. cristatum*, Wall.) attaining 3 in., in the small forms (*decurrens*, Wall.) $\frac{1}{2}$ –1 in. Sori often commencing from near the midrib.—Var. *udum*, W. S. Atkinson, is a form pendent from dripping rocks, the pinnae very oblique, closely fimbriate-pinnatifid on the margin. This variety is exceedingly unlike *A. decurrens*, Wall., which Beddome supposes it to be (see Ferns Brit. Ind. Suppl. p. 10); but it is found in Africa and Malaya as well as in the Himalaya, and must rank as a mere variety of *A. unilaterale*.

15. *A. HETEROCARPUM*, Wall. Cat. 218. Frond linear, glabrous, membranous; pinnae numerous, oblong, the lower margin cut away for the whole or nearly the whole length of the pinna.—Hook. Sp. Fil. iii. 132, t. 175; Bedd. Ferns South. Ind. t. 131; Hk. & Baker, Syn. Fil. 210. *A. cheilosorum*, Kunze; Mett. Farngatt. Aspl. 133, t. 5. fig. 12, 13.

Himalaya, alt. 4000–8000 feet; from Nepaul to Bhotan, frequent. Khasia, alt. 3000–5000 feet, frequent.—Distrib. Malay Peninsula, South China; Mts. of the South Deccan and Ceylon.

Sori rarely commencing from near the midrib, often confined almost to the teeth of the closely fimbriate upper margin of the pinnae.—This species is very near *A. unilaterale*, indeed so near that the Bourbon examples marked by Mr. Baker *A. heterocarpum* I refer to *A. unilaterale*.

**** *Fronds 2-pinnate or sub-2-pinnate (but varieties with subentire pinnae occur).*

16. *A. LACINIATUM*, Don, Prodr. Fl. Nep. 8. Stipe with lanceolate or linear scales; rachis upwards glabrous or very sparingly scaly; frond linear, with numerous oblong-linear pinnae; pinnae very unequal at the base, pinnatifid halfway to the midrib, or nearly or quite 2-pinnate, secondary segments with flabellate nerves and

sori.—Hook. Sp. Fil. iii. 164, t. 200 A; Bedd. Ferns South. Ind. t. 145; Hk. & Baker, Syn. Fil. 211. *A. planicaule*, Wall. Cat. 189; Mett. Farngatt. Aspl. 157; Hook. Sp. Fil. iii. 163, t. 200 B; Bedd. Ferns South. Ind. t. 189; Hk. & Baker, Syn. Fil. 211. *A. caespitosum*, Wall. Cat. 217. *A. depauperatum*, Wall. Cat. 234.

Himalaya, alt. 3000–8000 feet; from Gurwhal to Bhotan, common. Khasia, alt. 2000–5000 feet; very common.—Distrib. Mts. of Malabar from Bombay to Ceylon; Japan.

Rootstock tufted. Fronds 4–20 in. Pinnæ $\frac{1}{2}$ –1 $\frac{1}{2}$ in. The type of *A. laciniatum* is here supposed to be that given in Hook. Sp. Fil. iii. t. 200 A, which represents the abundant Khasi form; the segments of the pinna are here obovate or subauricular, the margin obtusely toothed or subcrenate.

According to Hk. & Baker, Syn. Fil. 211, the pinnæ are more deeply pinnatifid, the sori shorter than in *A. planicaule*, which they, no doubt, usually are.

Var. *planicaule*, (sp.) Hook. Sp. Fil. iii. 163, t. 200 B. Margin of the pinnæ with close acute, sometimes sublinear, teeth. The pinnæ are sometimes (as figured by Hooker) less pinnatifid than in *A. laciniatum* type, but not rarely sub-2-pinnate.

Var. *depauperata*. Fronds small; pinnæ pinnatifid less than halfway to the midrib, margin obtusely toothed or subcrenate.—Principally from Kumaon.—The existence of this variety destroys the value of the slight specific differences relied on by Hk. & Baker for distinguishing *A. planicaule* from *A. laciniatum*.

17. *A. PUMILUM*, Sw. Fl. Ind. Occ. iii. 1610. Rhachis glabrous or sparingly pubescent; pinnæ not numerous, upper pinnæ decurrent, lowest pinnæ pinnatifid nearly to the midrib.—Mett. Farngatt. Aspl. 127; Hook. Sp. Fil. iii. 174; Hk. & Baker, Syn. Fil. 212. *A. anthriscifolium*, Jacq. Coll. ii. 103, t. 2. figs. 3, 4.

Mexico, Central America, West-India Islands.

Tufted. Stipe 3–6 in. Frond 4–8 in., usually glabrous. Pinnæ often 2–3 in., ovate-lanceolate, acute, venation not prominent.—Not found hitherto in the Old World.

Var. *hymenophylloides*, Fée, 7th Mem. 54, t. 15. fig. 1. Frond smaller, pubescent or ciliate on both surfaces; texture exceedingly thin, with prominent venation, resembling that of *Hymenophyllum*; pinnæ obtuse.—*A. tenerimum*, (sp.) Hochst. in Schimp. Pl. Abyss. no. 2064.

Mt. Aboo, J. E. Stocks, Dalzell.—Distrib. Abyssinia, Zambesi-land.—The Indian examples agree closely with the Abyssinian, and differ considerably from the New-World typical *A. pumilum*.

***** Fronds 2–4-pinnate.

† Texture coriaceous; ultimate segments cuneate, shining above; venation flabellate.

18. *A. RUTA-MURARIA*, Linn. Sp. Pl. 1541. Frond small, glabrous, 1–3-pinnate; pinnæ not numerous, $\frac{1}{2}$ – $\frac{1}{4}$ in. diam., obovate or rhomboidal, not pinnatifid; margin of the involucre fimbriate.—Engl. Bot. t. 150; Mett. Farngatt. Aspl. 143; Hook. Sp. Fil. iii. 176, Brit. Ferns, t. 28; Bedd. Ferns Brit. Ind. t. 61; Milde, Fil. Europ. 76; Hk. & Baker, Syn. Fil. 213.

Kashmir and Baltistan, alt. 5000–8500 feet, *T. Thomson*, *H. C. Lvinge*, *C. B. Clarke*.—Distrib. North Europe, Asia, and America, extending southwards to the Mts. of Algiers and Kashmir; Cape Colony.

Rootstock tufted, wiry, fibrillose. Stipe 1–3 in., naked or with lanceolate-linear scales in its lower half. Pinnae very thick in texture, midrib obscure, minutely serrate; sori often ultimately covering the whole of the lower surface.

19. *A. PEKINENSE*, Hance in Seem. Journ. Bot. v. 262. Frond 2–5 in., narrowly oblong, 2-pinnate sub-3-pinnate, tertiary segments linear-cuneate or oblong-cuneate, sharply forked or toothed at their extremity, entire below.—*A. sepulchrale*, Hk. & Baker, Syn. Fil. 213; name changed to *A. pekinense*, Hance in 2nd ed. (Pl. LVI. fig. 2.)

Kashmir; Jhelum Valley, alt. 2000–2500 feet, *H. C. Lvinge*.—Distrib. China, Japan.

Tufted; stipe 1–3 in.; often with lanceolate-linear scales in the lower part. Frond glabrous, shining; in texture approaching *A. Adiantum-nigrum* rather than *A. varians* (with which it has been compared), but is oblong, not ovate-lanceolate. Involucre with entire margin. Sori ultimately confluent. Baker says one to a segment, which means 2–6 to a tertiary pinna, but not more than one to each tooth.

20. *A. ADIANTUM-NIGRUM*, Linn. Sp. Pl. 1541. Stipe shining, chestnut-coloured, glabrous, or with a few linear scales near the base; frond 2-pinnate, sub-3-pinnate, lanceolate or ovate-lanceolate; tertiary pinnae ovate or oblong, acutely serrate, not pinatifid; margin of the involucre entire.—Engl. Bot. t. 1950; Schk. Krypt. Gew. t. 80 A; Mett. Farngatt. Aspl. 144; Hook. Sp. Fil. iii. 187, Brit. Ferns, t. 33; Bedd. Ferns Brit. Ind. t. 62; Milde, Fil. Europ. 85; Hk. & Baker, Syn. Fil. 214. *A. humile*, Blume, Enum. Pl. Jav. Fil. 185, fide Hook.

Kashmir; alt. 5000–8000 feet, frequent; extending to Dalhousie and Chumba, alt. 4000–6000 feet, *C. B. Clarke*.—Distrib. Java; Europe; Northern Asia and Africa; Cape Colony; Polynesia.

The Kashmir plant agrees with the common European type, but is usually somewhat larger. The Indian examples are readily separable from all other Indian ferns.

21. *A. NITIDUM*, Swartz, Syn. Fil. 84, 280. Main rhachis glabrous or nearly so; frond shining green, large, 2-pinnate or 3-pinnate; ultimate pinnae $\frac{3}{4}$ in. or more, elliptic or cuneate, trapezoidal; sori long.—Schk. Krypt. Gew. t. 81; Blume, Enum. Pl. Jav. Fil. 188; Wall. Cat. 232; Mett. Farngatt. Aspl. 160, t. 5. fig. 31; Hook. Sp. Fil. iii. 172; Bedd. Ferns South. Ind. tt. 148, 149; Hk. & Baker, Syn. Fil. 215. *A. insigne*, Blume, Enum. Pl. Jav. Fil. 188. *A. pulchellum*, Wall. Cat. 214. *A. mysurense*, Roth, in Wall. Cat. 213. *A. splendens*, Kunze in Linnæa, x. 516; Mett. Farngatt. Aspl. 158; Hook. Sp. Fil. iii. 168.

Sikkim, Bhotan, Assam, Khasia, Cachar, alt. 1000–4000 feet; frequent, not in large quantity.—Distrib. Malay Peninsula and Islands; Ceylon; South Africa.

Tufted. Frond lanceolate or ovate-lanceolate; pinnae 2-12 in.—*A. furcatum*, Thunb.; Bedd. Ferns South. Ind. t. 144, differs from *A. nitidum* by having the main rhachis very scaly; it is said (in Hk. & Baker, Syn. Fil. 214) to grow in the Himalaya. There is one example of Griffith collected in Assam named at Kew *A. furcatum*; but it has the main rhachis quite glabrous, and I should call it typical *A. nitidum*. There is also a specimen added to Wallich's example of *A. mysurense* under which is written (not in Wallich's hand) "Sylhet;" but this sheet I call altogether *A. nitidum*, the ultimate pinnae being much broader than in *A. furcatum*.—*A. laserpitiifolium*, Lamk., Bedd. Ferns South. Ind. t. 225, differs from *A. nitidum* by being 3-4-pinnate (rather than 2-3 pinnate), the ultimate pinnae much smaller, and the sori therefore shorter. It is said to grow in Assam in Hk. & Baker, Syn. Fil. 214. The North-Indian specimens at Kew are *A. nitidum* for me; and the Burmese examples of Griffith, Kurz, and Brandis are also *A. nitidum*.—Beddome (Ferns Brit. Ind. Suppl. p. 11) says that *A. furcatum* is general in India, and *A. laserpitiifolium* is found in North India. Whether Col. Beddome has any evidence (beyond Hk. & Baker, Syn. Fil.) that these are North-Indian plants I do not know; there is no evidence at Kew: I never found either of them in North India, nor have I ever seen them from North India.—As to the synonymy, Hooker (in Syn. Fil. iii. 166) refers *A. mysurense*, Wall., to *A. furcatum*; but Wallich's name for *A. furcatum* was *A. hirsutum* (Wall. Cat. 212), from which his *A. mysurense* differs by having the main rhachis glabrous.—*A. cuneatum* β . *splendens*, as it has been called at Kew, is larger than *A. cuneatum*, Lamk., type; but I can find no difference whatever between it and *A. nitidum*. To sum up, the North-Indian *A. nitidum*, *furcatum*, and *laserpitiifolium* appear to me one species and one variety; the southern *A. furcatum* and *A. laserpitiifolium* are separable therefrom as varieties, perhaps as species.

***** Fronds lanceolate, herbaceous or scarcely coriaceous; venation pinnate.

22. *A. FONTANUM*, Bernh. in Schrad. Neu. Journ. i. pt. ii. 26. Frond elongate-lanceolate, narrowed at both ends, the lower pinnae reduced, often somewhat remote; pinnae numerous, pinnate or pinnatifid or toothed.—Engl. Bot. t. 2024; Mett. Farnagatt. Aspl. 140; Hook. Sp. Fil. iii. 193, Brit. Ferns, t. 34; Bedd. Ferns Brit. Ind. t. 146; Milde, Fil. Europ. 70; Hk. & Baker, Syn. Fil. 216. *A. Halleri*, Willd. Sp. Pl. v. 274. *A. exiguum*, Bedd. Ferns South. Ind. t. 146. *Aspidium fontanum*, Swartz; Schk. Krypt. Gew. t. 53.

From Kashmir to Gurwhal, alt. 5000-9000 feet, frequent.—Distrib. Nilgherries, Cabul, Lycia, South Europe to Britain.

Tufted. Stipes numerous, usually green; but there are sometimes a few chestnut-coloured stipes growing among numerous green ones. The lower pinnae are not always deflexed; nor are the central pinnae invariably sub-2-pinnate, as in the diagnosis of Hk. & Baker. Involucres usually 1 to each secondary pinna, ultimately large, covering nearly the whole segment.—Beddome's figure shows the lowest pinnae only slightly reduced, but (from the cutting) is no doubt taken from the true *A. fontanum*.

23. *A. VARIEANS*, Hk. & Grev. Ic. Fil. t. 172. Frond elongate-lanceolate, the lower pinnae not much reduced; pinnae 8-12 on each side, deeply pinnatifid or 2-pinnate into cuneate segments, acutely toothed on the outer edge.—Hook. Sp. Fil. iii. 192; Bedd. Ferns South. Ind. t. 129; Milde, Fil. Europ. 73; Hk. & Baker, Syn. Fil. 216. *A. Ruta*?, Wall. Cat. 233. *A. parvulum*, Wall. Cat. 2207. *A. fimbriatum* and var. *leptophyllum*, Kunze in Linnæa, xviii. 117, xxiv. 265; Mett. Farngatt. Aspl. 141.

Himalaya, alt. 6000-10,000 feet; frequent, becoming rare eastwards. Sikkim, Lachong, alt. 9000 feet, Sir J. D. Hooker. Bhotan, alt. 6500 feet, Griffith.—Distrib. Mts. of South India and Ceylon, North China, Japan, South Africa.

Pinnæ usually less numerous than those of *A. fontanum*, more irregularly cut and more acutely toothed; but the two species are very nearly allied. None of the Himalayan examples are difficult to separate from *A. lanceolatum*; but Beddome (in Ferns Brit. Ind. Suppl. p. 11) hints that the South-Indian examples are so difficult to separate from *A. lanceolatum* that the two species are probably one. The Kew *A. lanceolatum* is much firmer in texture, and runs nearer *A. Adiantum-nigrum*, Linn.

24. *A. BULBIFERUM*, Forst. Fl. Ins. Austral. Prodr. 80. Frond 1-4 feet, oblong-lanceolate or ovate-lanceolate, 2- or 3-pinnate; stipe scaly near the base, often more or less hairy throughout; rhachis of the primary pinnae subulate narrowly; sori large.—Schk. Krypt. Gew. t. 79; Hook. Ic. Pl. t. 423; Mett. Farngatt. Aspl. 106; Hook. Sp. Fil. iii. 196; Hk. & Baker, Syn. Fil. 218; Benth. Fl. Austral. vii. 748. *A. bullatum*, Wall. Cat. 215; Mett. Farngatt. Aspl. 106; Bedd. Ferns Brit. Ind. t. 65. *Athyrium macrocarpum*, Fée, Gén. Fil. 188, not of Hk. & Baker. *Ctenopteris appendiculata*, Labill. Fl. Nov. Holl. ii. 94, t. 243.

Nepaul, Sikkim, Bhotan, Khasia; alt. 2000-6000 feet; generally scattered, nowhere abundant.—Distrib. Penang, Australia, New Zealand, Bourbon, Natal, Mexico.

All the North-Indian specimens are alike. Frond a deep green, ultimate segments large, flaccid, the large sori often visible from the upper surface. Exactly the same type comes from New Zealand, where the fern is common and very variable. The sori are not marginal in the North-Indian form. If all the Kew examples from Natal, Mexico, Australia, &c. be called *A. bulbiferum*, the writing-out of the specific description becomes very difficult.

25. *A. TENUIFOLIUM*, Don, Prodr. Fl. Nep. 8. Frond 4-20 in., lanceolate, 3- or 4-pinnate; rhachis glabrous or nearly so; ultimate pinnae $\frac{1}{2}$ in. or less.—Mett. Farngatt. Aspl. 128; Hook. Sp. Fil. 193, 2nd Cent. Ferns, t. 29; Bedd. Ferns South. Ind. t. 130; Hk. & Baker, Syn. Fil. 220. *A. concinnum*, Wall. Cat. 216.

From Nepaul to Bhotan, alt. 5000-9000 feet, common. Khasia, alt. 4000-5500 feet, frequent.—Distrib. Moulmein, Mts. of South India and Ceylon.

Tufted. Stipe usually glabrous or with few scattered hairs. Frond green, thin. Sori ultimately nearly covering the small segments.—This is easily known from *A. bulbiferum*

by the much smaller ultimate pinnæ. The small forms are known from *A. fontanum* and *A. varians* by being more compound.

Subgenus III. *Darea*. Veins free, simple. Ultimate divisions of the frond linear. Involucres linear, dehiscing along the outer edge, not curved nor placed back to back, often extending in breadth from the vein to the very margin of the frond.

26. *A. RUTÆFOLIUM*, Kunze, in Linnæa, x. 521. Frond glabrous, narrowly oblong, 2-pinnate, or sub-2-pinnate; pinnæ very obtuse.—Mett. Farngatt. Aspl. 110; Hook. Sp. Fil. iii. 206; Hk. & Baker, Syn. Fil. 222. *A. stans*, Kunze, in Linnæa, x. 521. *A. prolongatum*, Hook. Sp. Fil. iii. 209, 2nd Cent. Ferns, t. 42; Bedd. Ferns South. Ind. t. 138.

Bhotan and Mishmee, *Griffith*. Khasia, *Simons*.—Distrib. Ceylon, South Africa, Japan, Fiji.

Frond 6–12 in., often much smaller than suits the sectional characters in Hk. & Baker; glaucous. The North-India examples often have the rhachis prolonged, naked, and rooting at the extremity; the ultimate pinnæ are $\frac{1}{4}$ in., the sori linear; the fronds are 2-pinnate, very sparingly 3-pinnatifid or sub-3-pinnate. The examples from North India are few, and all alike; but the South-African form a very variable series.

Subgenus IV. *Athyrium*. Veins free. Involucres linear or subquadrate (when young), dehiscing along the outer edge, not placed back to back, becoming in age often curved or horseshoe-shaped. Scales at the base of the stipe striated lengthwise, not clearly fenestrate.

The involucres are often short, and sometimes so completely recurved that they soon become nephrodioid. Thus *A. macrocarpum* has been maintained by Moore and others to be a *Lastrea*. To settle the genus, the fruit must be examined quite young to ascertain that the short involucre is attached by its edge along the vein and not across it. In other cases the involucres are very small and delicate, and the fern is supposed a *Davallia*. In *Davallia* the sorus should be *always* terminal on a vein, whereas in *Athyrium*, though the vein appears in some cases to terminate at the sorus, in others on the same frond it may be seen to be carried past it. Some *Athyriums* which have the involucre very thin are placed by some authors in *Cystopteris*; and in some cases it is very difficult to say whether the attachment of the evanescent involucre is lateral to the vein (*Athyrium*) or across it (*Cystopteris*). In other cases, the involucre is obsolete to such a degree, that Sir W. Hooker has considered *Polypodium oxyphyllum*, Wall., an exinvolucrate var. of *Aspidium eburneum*, Wall.; and Col. Beddome and Mr. Baker agree.

* *Rootstock creeping; stipes solitary, remote.*

27. *A. SPINULOSUM*, Hk. & Baker, Syn. Fil. 225. Frond 6–12 in., deltoid, as broad as long, 3-pinnate; tertiary pinnæ $\frac{1}{4}$ – $\frac{1}{3}$ in., oblong, sessile, lobed less than halfway to the midrib, spinulose-serrate; involucres subquadrate, ultimately curved, sometimes horseshoe-shaped.—*Cystopteris spinulosa*, Maxim. Prim. Fl. Amur. 340. *Athyrium Hookerianum*, Moore; Milde, Fil. Europ. 57.

Sikkim; Yakla Pass, alt. 12,000 feet, *W. S. Atkinson*.—Distrib. Manchuria.

Lowest pinnæ longest, subopposite. Primary pinnæ in outline lanceolate, narrower at the base; secondary pinnæ narrow-oblong acute, not narrower at the base. Involucre very small and thin.—Maximowicz, in his description, states that the sori are lateral (as they distinctly are in this species); it is therefore not clear why Maximowicz called the plant a *Cystopteris*. Beddome's picture shows the tertiary pinnæ confluent, so that the frond is 2-pinnate; in all the Kew examples the tertiary pinnæ stand rather wide apart, but they are sessile, and the rhachis of the secondary pinnæ narrowly subulate by their decurrence.

Var. *subtriangularis*, (sp.) Hk. & Baker, Syn. Fil. 225. Tertiary pinnæ crenate serrate.

Sikkim, alt. 10,000–12,000 feet; Lachen, Samding, Yeumtong, *Sir J. D. Hooker*.—I can find no difference between this and *A. spinulosum* type, except that the teeth are much less spinulose, sometimes hardly acute.

28. *A. ATKINSONI*, C. B. Clarke. Frond 10–12 in., deltoid, as broad as long, 3-pinnate, 4-pinnatifid; veins terminating just within the margin.—*Athyrium Atkinsoni*, Bedd. Ferns Brit. Ind. Suppl. p. 11, t. 359.

Sikkim, at high levels, *W. S. Atkinson*.

Stipes 6–12 in., straw-coloured, with a few long, narrow, pale scales near the base. Pinnæ 7–8 on each side, texture herbaceous, lowest much the largest, 6 by 3 in. Involucres subquadrate, *i.e.* hardly longer than broad.—The above is drawn entirely from Col. Beddome's figure and description. I must have been with *W. S. Atkinson* when he collected this plant; but none of my alpine Sikkim *Athyriums* agrees with Col. Beddome's figure. I suspect that figure is from a small specimen of the following.

Var. *Andersoni*. Frond 9–27 in., 4-pinnate, 5-pinnatifid. (Pl. LVII.)

Sikkim, alt. 9000–12,000 feet, Tonglo and Singalelah, *Dr. Jerdon, C. B. Clarke*.—Stipes solitary. Rhachis red, wavy, slightly scaly, and glandular-rugose. Texture rigid. Lowest pinnæ often 14 in.; lowest secondary pinnæ shorter than those above them. No gland at the bases of the primary pinnæ. Sori somewhat large ultimately, nearly covering the quaternary pinnæ, which are $\frac{1}{4}$ – $\frac{1}{3}$ in., short-oblong, bluntly crenate-pinnatifid halfway to the midrib.

** *Stipes tufted or approximate.*

29. *A. DREPANOPHYLLUM*, Hk. & Baker, Syn. Fil. (2nd ed.) 226. Frond linear, narrowed to both ends; pinnæ numerous, 1–1½ by $\frac{1}{4}$ – $\frac{1}{3}$ in., subentire, pinnatifid halfway down, or at the base cut down nearly to the midrib into short-oblong subobtusate lobes; involucres, when young, linear or linear-oblong.—*Athyrium falcatum*, Bedd. Ferns South. Ind. t. 151.

Parasnath, in Chota Nagpore, alt. 4000 feet, *C. B. Clarke*.—Distrib. Mts. of Malabar, from Mahabaleshwur and Belgaum to the Anamallays.

Stipe 1–9 in., with many linear reddish scales at the base. Frond 2–12 in.; pinnæ sometimes 15–20 on each side the main rhachis. Lobes entire, crenate, or very shallowly

toothed. Lowest secondary pinna (i. e. lobe) of the upper edge often larger than the rest, so that the pinnae are auriculate, and sometimes also falcate. Sori only appear globose when broken down: Beddome's left-hand figure must have been from an over-ripe example. Sori often in two rows near the midrib of the pinna; sometimes smaller sori are seen added in the lobes; in larger examples the sori are in two rows in each secondary pinna.

30. *A. thelypteroides*, Michx. Fl. Bor.-Am. ii. 265. Frond 1-5 feet, linear-lanceolate, narrowed to both ends; pinnae numerous, deeply regularly pinnatifid; lobes broad-oblong, subobtusate; veins simple, parallel, each lower one often bearing an involucre, so that the sori appear in two close parallel rows in each lobe.—Schk. Krypt. Gew. t. 76 b; Mett. Farngatt. Aspl. 184; Hook. Sp. Fil. iii. 220; Hk. & Baker, Syn. Fil. 226. *A. acrostichoides*, Swartz, Syn. Fil. 82, 275. *Diplazium thelypteroides*, Bedd. Ferns Brit. Ind. t. 68. *Athyrium thelypteroides*, Desv.; Milde, Fil. Europ. 54. *A. allantodioides*, Bedd. Ferns Brit. Ind. t. 221; see Hk. & Baker, Syn. Fil. (2nd ed.) 489.

Himalaya, alt. 7000-12,000 feet; from Kashmir to Bhotan, in many places abundant.—Distrib. Amurland, North America; *not* in Penang.

Stipes tufted; but the rootstock is creeping in one American example. Stipe scaly at the base, and more or less hairy, sometimes hairy throughout the main rhachis. Frond sometimes suddenly narrowed at the base, leaving a stipe of 2-6 in., sometimes gradually decreasing to distant auricles, so that there is hardly any stipe. Pinnae 3 in. ($1\frac{1}{2}$ -5 in.) by $\frac{1}{2}$ - $\frac{3}{4}$ in., broadest at the base, tapering very gradually. Secondary pinnae (lobes) $\frac{1}{4}$ - $\frac{1}{2}$ in., subentire, or slightly denticulate. Involucre strictly *Athyrioid*, i. e. it dehisces by a very clean cut from the outer edge; involucres usually firm, white, and permanent on the ripe fruit.—Both Col. Beddome's figures are unsatisfactory as to the involucre, which is shown in t. 68 as diplazioid, in t. 221 as though allantodioid; but the letter-press to t. 221 corrects that impression.—As to varieties, W. S. Atkinson obtained this fern in quantity in East Sikkim and Bhotan, and proposed two varieties: viz. α , frond small, suddenly narrowed at the base, rhachis very hairy throughout; β , frond large, tapering by auricles nearly to the base of the stipe, rhachis glabrous or nearly so. Beddome (working over, I believe, the same material) found that these characters were not trustworthy, and made his new species *Athyrium allantodioides* on the character of the shortness of the sori. I have collected this fern in Kashmir, in Bhotan, and at several intermediate points; and I can make no varieties at all. The involucres are usually very straight-edged where they are attached to the vein even in ripe fruit; but I have collected an example in which the upper involucres appear exactly as of *Lastrea*.

31. *A. macrocarpum*, Hook. Sp. Fil. iii. 222. Frond 6-36 in., oblong-lanceolate, bipinnate; secondary pinnae $\frac{1}{2}$ -1 $\frac{1}{2}$ in., oblong or ovate-falcate; texture herbaceous, when dry not coriaceous shining plicate-striate beneath, subentire, lobed or pinnatifid nearly to the rhachis, the lowest lobe on the upper side often larger, so

that the plant is serrulate, margin more or less toothed scarcely ever spinulose; sori large; involucre little lacinate on the margin, very permanent, finally curved or often in appearance Nephroidoid.—Hk. & Baker, Syn. Fil. 227. *A. fallax*, *decipiens*, and *Goringianum*, Mett. Farngett. Aspl. 194, 195, 198, t. 6. figs. 7–12. *Aspidium macrocarpum*, Blume, Haum. Pl. Jav. Fil. 162. *A. squarrosum*, Wall. Cat. 856. *Lastrea? macrocarpa*, Moore, Ind. Fil. ii. 95. *Athyrium macrocarpum*, Bedd. Ferns South. Ind. tt. 152, 153.

Himalaya, from Gurwhal to Bhotan, alt. 2000–3000 feet, very common. Khasia, alt. 2000–3000 feet; very common.—Distrib. Deccan and Ceylon, Malay Peninsula and Islands, China, Japan.

One of the most abundant and variable of Indian ferns. The above diagnosis applies to the whole Kew bundle, which is very uniform in character, as Mr. Baker has sorted the doubtful forms between *A. Filix-femina*, *oxyphyllum*, and *fimbriatum*. The fern is usually 2-pinnate: Beddome (Ferns South. Ind. t. 152) shows a form that is 1-pinnate, scarcely 2-pinnate; Wallich's *A. squarrosum* is 2-pinnate, very nearly 3-pinnate, and there is, I fear, no line to be drawn between this and *fimbriatum* below. The frond is usually oblong-lanceolate; but I have collected it triangular, little longer than the breadth of the lowest pair of pinnæ. The involucre, as it becomes ripe, is so Nephroidoid that it is impossible to distinguish some examples in late fruit from *Nephrodium sparsum*. Beddome (Ferns Brit. Ind. Suppl. p. 11) refers here *Nephrodium sparsum*, var. *membranaceum*, Arn.; Hk. & Baker, Syn. Fil. (2nd ed.) 498; and the only example at Kew so named is *Asplenium macrocarpum*, as has been noted on the sheet by Beddome. The Himalayan high-level small examples, with numerous red scales at the base of the stipe, very shining fronds much striate beneath when dry, and fugacious involucre, are here referred to *A. oxyphyllum*. There remain in the Kew bundles now only two forms aberrant from the minute diagnosis above given, viz.:—

Var. 1-pinnata. Frond linear, pinnæ numerous, subentire, slightly crenate serrate on the upper margin.

Khasia, alt. 3000–4000 feet, frequent.—This has been much confounded with *Polystichum auriculatum*, Swartz; but I have connecting forms among stipes on the same rhizome, and the young fruit is clearly *Asplenium*.

Var. *Atkinsoni*, Hk. & Baker, Syn. Fil. (ed. 2nd) 489. Frond linear; pinnæ $\frac{1}{4}$ in., bluntly lobed about halfway to the midrib; involucre large, fimbriate on the margin, very little curved.

Sikkim, alt. 7000–8000 feet.—Intermediate forms connecting this with the type are desired still: the var. 1-pinnata is not intermediate. Col. Beddome remarks that this is not a “distinct variety.” I originally marked it a variety only, because I thought it indistinct.

32. A. CLARKEI, W. S. Atkinson, MS. Fronds 1–3 feet, linear-lanceolate, 2-pinnate, bending over and rooting from a bud on the upper part of the rhachis; secondary

pinnæ oblong, lobed hardly halfway to the midrib; sori linear-oblong, hardly more curved when ripe, rarely diplazioid.—*A. tenuifrons*, Wall. Cat. 206 (part only of type sheet). *Athyrium Clarkei*, Bedd. Ferns Brit. Ind. Suppl. ii. t. 360. *Allantodia denticulata*, Wall. sub Wall. Cat. 206.

Nepaul, *Wallich*. Sikkim, *T. Thomson*; Kulhait Valley, alt. 6000–7000 feet, in the sandy swamp at the foot of the steep ascent to Singalelah, in quantity, *W. S. Atkinson* and *C. B. Clarke*.

Rhizome stout, tufted, standing 2 in. out of the wet sand, with a cluster of stipes at the top, radiating round and rooting in a circle, at a radius of about 2 feet from the central rhizome: the subterminal rooting-bud seems always present in well-developed fronds; rarely there are two rooting-buds. Frond tapering at both ends, but not decurrent at the base nor with auricles. Pinnæ 1–3 in., green, glabrous, or the rhachis beneath densely pubescent, subvillous; the rhachis above often setulose; a solitary pinna in texture, cutting, and sori would be supposed to belong to *A. nigripes*, of which this may be a local accidental form. The fern is often setulose on the upper surface, as is typical *A. nigripes*. The Kumaon plants referred to *A. tenuifrons*, Wall., are setulose on the upper surface, and are *A. strigillosum*, Moore in Lowe's Ferns, v. 36; but they are broadly lanceolate, without any terminal bud, and therefore *A. nigripes* for me; but I fear the two species coalesce at this point.

33. *A. NIGRIPES*, Mett. Farngatt. Aspl. 195. Stipe firm, round, glabrous; frond 8–30 in., oblong-lanceolate, not tapering at the base, 2-pinnate, herbaceous or coriaceous, but not plicate-striate beneath; secondary pinnules oblong or elliptic, more or less lobed or pinnatifid, serrate not spinulose; sori linear-oblong, slightly curved, in two oblique rows towards the midrib of the pinna; involucres persistent.—Hook. Sp. Fil. iii. 222; Hk. & Baker, Syn. Fil. 227. *A. costale*, Blume, Enum. Pl. Jav. Fil. 170, not of Swartz. *A. spectabile*, Wall. Cat. 237. *A. gymnogrammoides*, Klotzsch; Mett. Farngatt. Aspl. 193, t. 6. figs. 13, 14; Hook. Sp. Fil. iii. 227. *Athyrium nigripes*, Bedd. Ferns South. Ind. t. 157. *A. gymnogrammoides*, Bedd. Ferns South. Ind. t. 156. *Allantodia incisa*, Wall. sub Wall. Cat. 231.

Himalaya, alt. 3000–11,000 feet; from Kashmir to Bhotan, very common. Khasia, alt. 2000–6000, very common.—Distrib. Mts. of South India and Ceylon, Malay Peninsula and Islands, China.

Stipes tufted; the caudex often stout, 2–6 in. high out of the ground. The Himalayan series thus named is very uniform in character, and is represented well by Bedd. Ferns South. Ind. t. 157. This differs from *A. macrocarpum* by the nearly straight involucres, from *A. oxyphyllum* by the permanent involucres. *A. gymnogrammoides*, Klotzsch, is a var. with large secondary pinnæ $1\frac{1}{2}$ in. long; *A. gymnogrammoides*, Bedd. Ferns South. Ind. t. 156, is 3-pinnate; but these are doubtless all one species. Some of the high alpine forms are very small, the whole frond but 3–8 in. high, delicate in texture, the secondary pinnæ narrow, linear-oblong. Other forms are triangular, the lowest pair of pinnæ being the broadest. More marked varieties are

Var. 1. *selenopteris*, (sp.) Kunze; Mett. Farngatt. Aspl. 196. Frond 3-pinnate, 4-pinnatifid, ultimate lobes incise-serrate.

Khasia, *Griffith*.—This form seems common in the Malay Peninsula and Islands, but was originally described from the Nilgherries.

Var. 2. *dissecta*, Moore? Frond 2-pinnate; secondary pinnæ incise-serrate, almost spinulose; sori short, subquadrate.—*Allantodia tenella*, Wall. sub Wall. Cat. 206.

Himalaya, alt. 10,000–13,000 feet, common.—This is perhaps not the original *dissectum* of Moore; but it is usually so marked in the Herbarium, and I cannot distinguish the Himalayan from the Japan plant; nor can I draw any line between it and some of the forms placed under *A. Filix-fœmina*.

[*Athyrium gymnogrammoides*, var. *erythrorachis*, Bedd. Ferns Brit. Ind. Suppl. p. 12, of which there are many examples from Ceylon at Kew, has very straight large sori, and seems quite distinct from *Asplenium nigripes*.]

34. A. FILIX-FÆMINA, Bernh. in Schrad. Neu. Journ. i. pt. ii. 26, t. 2. fig. 7 (*forma Europæa*). Frond 1–4 feet, lanceolate, narrowed at both ends, membranous, green, 2-pinnate; rhachis soft, appearing triangular or furrowed when dry; primary pinnæ narrow linear-oblong, hardly narrowed at the base; secondary pinnæ $\frac{1}{4}$ –1 in., oblong, patent at right angles to the rhachis of the primary pinnæ, sessile or decurrent, serrate or pinnatifid, margin bluntly or acutely toothed; involucre in two rows on the secondary pinnæ, short-oblong, subpersistent.—Mett. Fil. Hort. Lips. 79, t. 13. figs. 15, 16; Hook. Sp. Fil. iii. 217 (excl. syn. *tenuifrons*, Wall., and *strigillosum*, Moore), Brit. Ferns, t. 35; Hk. & Baker, Syn. Fil. 227 (excl. syn.). *Aspidium Filix-fœmina*, Swartz; Schk. Krypt. Gew. tt. 58, 59; Engl. Bot. t. 1459. *Aspidium Athyrium*, Spreng.; Schk. Krypt. Gew. t. 78. *A. Filix-fœmina*, Roth; Milde, Fil. Europ. 49.

Arctic and Temperate Asia, Europe, North America. The typical form has not exactly been obtained in the Himalaya; but the var. 1, *dentigera*, is very near it. In the arrangement of the Indian material I have carried all the plants with shining texture, appearing striated when dry, to *A. oxyphyllum*, and all the plants completely pinnated more than twice (except *A. pectinatum*) to *A. fimbriatum*. There are two main types of Himalayan *A. Filix-fœmina*, viz.:—*a*, with a succulent rhachis appearing triangular or grooved when dry, green, involucre subpersistent; and *b*, with a firm rhachis appearing round in the dried specimens, often red, involucre less persistent, often fugacious. The set *b* grow at a higher elevation than *a*; but from the detailed descriptions it will be seen that I have not been able to establish them as a species.

Var. 1. *dentigera*. Cutting nearly as in the European type, green, rhachis succulent, appearing grooved when dry; involucre subquadrate or horseshoe-shaped, smaller and less persistent than in the European type.—*Polypodium dentigerum*, Wall. Cat. 334.

Himalaya, alt. 6000–11,000 feet, from Kashmir to Bhotan; common from Nepaul westwards.—The large forms have the upper primary pinnæ ascending very oblique;

the smaller forms have all the primary pinnae patent. In the typical *dentigera*, Wall., the secondary pinnae are distant; but I cannot separate a form marked *A. foliolosum*, Wall., in the Herbarium, which has the pinnae approximate. I give no picture of this var.; for Hook. Brit. Ferns, t. 35, represents it perfectly except as to the involucre.

Var. 2. *pectinata*, (sp.) Wall. Cat. 281, as to type sheet only, and not of Bedd. Ferns South. Ind. t. 155. Tripinnate, 4-pinnatifid, finely cut, bright green; rhachis slender, but scarcely succulent or grooved when dry; involucre subquadrate or short-oblong, little horseshoe-shaped, subpersistent. (Pl. LVIII.)

Himalaya, from Sikkim to Gurwhal, alt. 2000–5000 feet; in Sikkim always on dry burning slopes to the south, where it is frequent. Parasnath, in Chota Nagpore, alt. 4000–4500 feet, *T. Thomson*, *C. B. Clarke*—where it is not completely 3-pinnate, the secondary rhachises being very narrowly winged. Mr. Baker considers this the best marked among all the varieties of *A. Filix-fœmina*.—The var. *tenella*, figured by Bedd. Ferns South. Ind. t. 154, has been received at Kew from Mahabaleshwur and from Scinde, but not from South India; it has been placed as a subvariety of *A. pectinatum*; but I think it surely does not belong here. It is more difficult to say where it should be placed; perhaps near var. *retusa*.

Var. 3. *attenuata*. 1-pinnate; base of stipe densely clothed with broad-lanceolate scales; rhachis succulent, when dry grooved or triangular; frond small, very narrow, much tapering at both ends; pinnae patent, very close together, deeply regularly pinnatifid into oblong serrated segments, scarcely $\frac{1}{4}$ in. long; involucre small, subquadrate, hardly ever horseshoe-shaped, not very fugacious. (Pl. LIX. fig. 1.)

Kashmir, alt. 10,000–12,000 feet, north of the main valley, *C. B. Clarke*.—This may be allowed specific rank possibly; but it comes near some small forms of var. 1, *dentigera*.

Var. 4. *retusa*. 1–2-pinnate; rhachis firm, appearing round when dry; frond red, never very large; involucre small, fugacious; sori scattered, round.—*Cystopteris retusa*, Decne. in Jacquem. Voy. Bot. 176, t. 177.

Himalaya, alt. 10,000–15,000 feet, from Kashmir to Bhotan, abundant; in the Western Himalaya descending as low as 10,000 feet.—This is really a well-marked series, differing considerably in size, the upper level specimens being often small; and being largely collected in autumn, when the involucre has vanished, it is common in Herbaria, marked *Lastrea*, *Cystopteris*, *Polypodium*, &c. Decaisne figures a high-level starved form; the type is *Athyrium rubricaulæ*, Edgw. MS. (Pl. LIX. fig. 2). There are other varieties which have the secondary pinnae more pinnatifid; but they are never acutely cut in this var. (unless var. *flabellulata* be included). The involucre is less fugacious in the large forms: in one Sikkim form the lowest involucre in each secondary pinna is deeply horseshoe-shaped, sometimes diplazioid, while all the other involucre are quite straight. Another Sikkim form has the main and secondary rhachises pubescent. Even the large forms of this species are rarely truly 2-pinnate; *i. e.* the secondary rhachises are usually winged, if but narrowly. The fronds are often little narrowed below; but in one common

form the frond is very narrow, attenuated at both ends, distinctly 1-pinnate. This var. does not, I think, run into var. 3, *attenuata*.

Var. 5. *flabellulata*. 2-pinnate; rhachis firm, appearing round when dry; frond red, 1-3 feet; secondary pinnæ deeply pinnatifid, segments laciniate; involucre small, fugacious; sori scattered, round. (Pl. LX.)

Sikkim, alt. 13,000 feet; Yakla, Jongri, C. B. Clarke.—In cutting this is very like some forms of var. 1, *dentigera*; but it is really, I believe, a highly developed form of var. 4, *retusa*.

Var. 6. *polyspora*. 2-pinnate, often sub-3-pinnate; rhachis firm, appearing round when dry; frond red, 1-3 feet; involucres large, approximate, very persistent, often nephrodioid; sori large, often ultimately thickly covering the whole of the pinnules. (Pl. LXI. fig. 1.)

North-west Himalaya, alt. 6000-10,000 feet, from Kumaon to Chumba.—This fern appears very restricted in area. I am in great doubt as to its affinity: the large sori point to *A. macrocarpum*, var. *squarrosum*; but the sharply serrate margin has caused every body to refer it to *A. Filix-femina*.

Var. 7. *Parasnathensis*. 1-pinnate, sub-2-pinnate; rhachis appearing triangular when dry; frond reddish, 1½ foot, narrow-oblong, scarcely attenuated at the base; primary pinnæ 1½ in., broadest at the base; secondary pinnæ ¼-½ in., acutely toothed, scarcely pinnatifid; involucres short-oblong, in two oblique rows, very persistent. (Pl. LXI. fig. 2.)

Parasnath, in Chota Nagpore, alt. 4000 feet, C. B. Clarke.—I can make nothing of this, except that I do not think it is at all nearly connected with any form of Indian *A. Filix-femina*.

35. *A. OXYPHYLLUM*, Hook. Sp. Fil. iii. 221, not of Wall. nor of J. Smith. Scales at the base of the stipe many linear-lanceolate, reddish; frond 6-36 in., oblong-lanceolate, 2-pinnate, slightly narrowed never attenuate at the base, coriaceous, rigid, somewhat shining beneath, with numerous fine striations in the dried state; primary pinnæ often falcate; secondary pinnæ distinct, usually auriculate, sometimes sub-entire scimitar-shaped, sometimes deeply pinnatifid; involucre small fugacious or none; sori round, punctiform, or polypodioid.—Hk. & Baker, Syn. Fil. 228. *A. eburneum*, Mett. Farngatt. Aspl. 194. *Athyrium oxyphyllum*, Bedd. Ferns Brit. Ind. t. 67. *A. stramineum*, J. Smith; Moore, Ind. Fil. ii. 188. *Aspidium drepanopterum*, A. Braun; Mett. Fil. Hort. Lips. 93, t. 19. figs. 1-4. *A. eburneum*, Wall. Cat. 389, partly, not as to type sheet. *Lastrea eburnea*, J. Smith, Enum. Ferns cult. at Kew, 1845, 28. *Polypodium drepanopterum*, Kunze, in Linnæa, xxiii. 318. *P. oxyphyllum*, Wall. Cat. 324. *P. Kulhaitense*, W. S. Atkinson, MS.

Himalaya, alt. 4000-11,000 feet, from Gurwhal to Bhotan; very common from Nepaul eastwards. Khasia, alt. 3000-6000 feet, common.—Distrib. Confined to North India; i. e. the Java and Japan examples placed here by Mr. Baker I remove to *A. macrocarpum* and *A. niponicum* respectively.

This set of plants is tolerably well separated from all the other Indian *Athyriums* by

1. *oxyphyllum*, Hook. Involucre Cystopteroid, some lateral, some across the vein when young, evanescent, but still usually to be discovered till the fruit is quite ripe; sori small, not nearly covering the pinnæ when ripe.
2. *Kulhaitense*, W. S. Atkinson. Involucre none, the sorus first appearing as a point over which no scale is discoverable with the microscope; sori increasing and becoming subglobose, ultimately often covering the whole surface of the pinnæ, or nearly so.—This has been kept separate, and distributed under a separate name, and it may not be a worse species than some of the *Polypodium multilineatum* set; but Col. Beddome considers it merely an exinvolucrate variety of *A. oxyphyllum*, which view the exact conformity of the two species in every other particular and in habitat confirms.

[*A. aspidioides*, Schlecht., is stated by Bedd. Ferns South. Ind. Suppl. p. 12, to be "general" in India; but Mr. Baker does not admit it north of the Nilgherries, and I concur in his sorting.]

36. *A. BREVISORUM*, Wall. Cat. 220, not of Mett. Frond large, oblong-lanceolate, 2-pinnate or 3-pinnate, the ultimate pinnæ in either case narrowly oblong-lanceolate, with an entire centre, the margin coarsely serrate, hardly pinnatifid; sori very long.—Hook. Sp. Fil. iii. 229; Hk. & Baker, Syn. Fil. 228. *Athyrium brevisorum*, J. Smith; Bedd. Ferns Brit. Ind. t. 241.

Mishmee, *Griffith*.—Distrib. Taongdong Mts. near Ava, *Wallich*. The Natal example is (mihi) not the Indian species: from the Sandwich Islands I find no example.

Easily recognized by the linear sori, which are much longer than in any other Indian *Athyrium*. *Wallich*'s example is 2-pinnate, *Griffith*'s 3-pinnate, one pinna of *Griffith*'s closely resembling the whole frond of *Wallich*'s.

37. *A. FIMBRIATUM*, Hook. Sp. Fil. iii. 234. Stipe usually with lanceolate setaceous yellow or brown scales; frond large, oblong-lanceolate, 3–4-pinnate, not attenuated at the base; pinnæ usually falcate; involucres curved or horseshoe-shaped, subpersistent.—Hk. & Baker, Syn. Fil. 229. *Athyrium fimbriatum*, Bedd. Ferns Brit. Ind. t. 295. *Aspidium fimbriatum*, Wall. Cat. 339.

Frequent at high levels in Sikkim and Nepaul.—Oblong or triangular in outline.

Var. *sphæropteroides*. Involucre small, early disappearing; sori both lateral and terminal on the veins, becoming soon globose, often appearing elevated from the frond. (Pl. LXII. fig. 1.)

Throughout the Himalaya, alt. 9000–13,000 feet, very common.—I include here a number of forms which I have distributed under the names *sphæropteroides*, *rubricaulis*, and *Andersoni*. *A. sphæropteroides* type is often 6–8 feet high, triangular in outline, the lowest pinnæ 2 feet, the quaternary pinnæ oblong, hardly lobed or pinnatifid. Sir W. J. Hooker had a specimen of this in over-ripe fruit, which he marked “*Davallia* an *Sphæropteris* sp. 2?” There are small 3-pinnate examples which, having gathered from the same tufts, I know to be varieties of this. There are other forms with the sori large, ultimately covering the whole lower surface of the frond; on one of these Col. Beddome has noted “vix *A. fimbriatum*.” I have another very large compound plant, finely cut, with smaller sori and more persistent involucre, which connects *A. sphæropteroides* with the type. Pl. LXII. fig. 1 is taken from a very small example of the var. *sphæropteroides*.

Subgenus V. *Pseud-Allantodia*. Veins free. Involucres oblong or subquadrate, not curved in age, rarely placed back to back, not dehiscing from the outer edge, but breaking up from the middle of the back irregularly. (Differs from genus *Allantodia* by the free veins.)

38. *A. PROCERUM*, Wall. Cat. 2203. Rhizome very shortly creeping; stipe muricate, yellowish; frond large, 3–4-pinnate, herbaceous, green; primary pinnæ 1–2 feet; ultimate pinnæ pinnatifid $\frac{1}{2}$ or $\frac{3}{4}$ to the midrib into oblong crenate, scarcely serrate lobes; veins in the lobes often forked; sori short, oblong, mostly in two rows, near the midrib of the ultimate pinnæ and parallel thereto; involucre delicate.—*A. umbrosum*, var. *procerum*, Hk. & Baker, Syn. Fil. (2nd ed.). (Pl. LXIII. fig. 1.)

Himalaya, from Kumaon to Bhotan, alt. 4000–8000 feet, very common. Assam, Khasia, alt. 3000–8000 feet, very common.

A most abundant Sikkim and Khasia fern, remarkably constant in character. It is no use quoting synonyms for it, as I arrange the material in the Kew Herbarium bundles differently from Baker. Col. Beddome has marked it “*Athyrium aspidioides*?”;

but the involucre is totally different as from all forms of *A. australe*, Brack. *A. procerum* is perhaps nearest *A. multicaudatum*, in which the involucres are not allantodioid, and which has a wide-creeping root; the sori are differently placed also. A Madeira form of *A. umbrosum*, A. Smith, has the sori allantodioid, but the cutting of the frond is totally unlike that of *A. procerum*.

Var. *Mishmica*. Ultimate segments more approximate than in the typical *A. procerum*; sori small, in two rows near the midrib of the segments.

Mishmee, *Griffith*. Khasia and Sikkim, alt. 1000 feet, C. B. Clarke.—Involucre allantodioid, not rarely diplazioid; veins in the ultimate segments often forked.

39. *A. BELLUM*, C. B. Clarke. Stipes tufted, from a caudex sometimes standing a foot out of the ground; stipe muricate, reddish, with long lanceolate chestnut scales at the base; frond large, sub-3-pinnate; primary pinnæ 1–2 feet; tertiary pinnæ (segments) oblong crenate serrate, hardly pinnatifid; veins rarely forked; sori short, oblong, not very close to the midrib.—*Aspidium marginatum*, Wall. Cat. 391, partly. (Pl. LXIII. fig. 2.)

Sikkim and Bhotan, alt. 1000–5000 feet, frequently collected and very many times seen, C. B. Clarke. Khasia, alt. 4000 feet, Cherra, Sir J. D. Hooker.

Sir J. D. Hooker marked his specimen *Gymnosphæra gigantea*; it has been removed to *Asplenium* by Baker without providing any name for it. The cutting and venation greatly resemble that of *Alsophila glabra*, and the sori are subquadrate; but the involucre bursting at the back the sori as they ripen appear in a Cyatheoid hyposorous involucre, which, however, is boat-shaped instead of hemispherical. The tertiary pinnæ (though not quite free themselves) are sometimes subpinnatifid when the veins in them are subpinnate (as in similar cases in all ferns): these examples look different from the type, but I have cut them from the same caudex.

Subgenus VI. *Diplazium*. Veins free. Involucres linear or oblong, not or very slightly curved, some placed back to back, dehiscing from their outer edge.

* *Fronds simple, entire or nearly so.*

40. *A. LANCEUM*, Thunb. Fl. Japon. 333; Ic. Pl. Japon. Dec. ii. t. 8. Rootstock wiry, creeping, with small, linear, black scales; stipes manifest, not crowded; frond narrow-lanceolate or linear entire.—Hook. Sp. Fil. iii. 235; Mett. Farngatt. Aspl. 161; Benth. Fl. Hongk. 451; Hk. & Baker, Syn. Fil. 229. *A. subsinuatum*, Wall. Cat. 199; Hk. & Grev. Ic. Fil. t. 27. *Scolopendrium dubium*, Don, Prodr. Fl. Nep. 9. *Diplazium lanceum*, Presl; Bedd. Ferns South. Ind. t. 227, not of Bory in Bélanger Voy. Bot. Crypt. 37, t. iv.

Assam and North-east Bengal, alt. 500–5000 feet, not very common; extending to Chittagong, C. B. Clarke, and to East Nepaul, Wallich.—Distrib. Ceylon, China, Formosa, Japan.

Frond variable in length, but not much in breadth—from 3 by $\frac{1}{2}$ in. to 12 by $\frac{3}{4}$ in.

** *Fronde 1-pinnate, not 2-pinnate except in A. japonicum, var.*

41. *A. BANTAMENSE*, Hk. & Baker, Syn. Fil. 231. Rootstock creeping, as thick as a goose-quill; stipe with lanceolate caducous scales; pinnæ on each side the main rhachis 8-6, usually all free, alternate or not rarely subopposite, rhomboid rounded or acute at base, entire or crenate-serrate towards the apex.—*A. alternifolium*, Mett. Fil. Hort. Lips. 75, t. 12. figs. 1, 2, and in Ann. Mus. Lugd. Bat. ii. 237; Hook. Fil. Exot. t. 17, Sp. Fil. iii. 239. *A. fraxinifolium*, Wall. Cat. 194; Hook. Sp. Fil. iii. 240, 2nd Cent. Ferns, t. 19; Benth. Fl. Hongk. 454, partly. *A. Donianum*, Mett. Farngett. Aspl. 177. *A. Hookerianum*, Wall. Cat. 7090, not of Wall. Cat. 2682, nor of Colenso. *Diplazium alternifolium* and *bantamense*, Blume, Enum. Pl. Jav. Fil. 190, 191. *D. fraxinifolium*, Bedd. Ferns Brit. Ind. t. 69; the syn. *A. elegans* to be excluded everywhere.

Khasia; alt. 4000 feet, frequent. Cachar, alt. 500 feet, Sir J. D. Hooker, R. L. Keenan. Chittagong, alt. 200 feet, C. B. Clarke.—Distrib. Tinnevely; Malay Peninsula and Islands; South China.

The Aneiteum examples have the pinnæ subopposite, and (invariably) a bud on the rhachis at the base of the penultimate pinna: this is Wallich's *A. fraxinifolium*. The pinnæ are often subopposite in Indian examples; the penultimate bud I have only once found.—*Diplazium falcatum*, Don, Prodr. Fl. Nep. 13, from the description seems the present fern, but there is no authentic example; and *A. bantamense* is not otherwise known from the Himalayas, so that it is not likely that Wallich collected it so far west as Narainhatty. This is, I believe, the only authority for the locality Himalayas.

42. *A. LOBBIANUM*, Hook. 2nd Cent. Ferns, t. 17, Sp. Fil. iii. 244. Coriaceous, uppermost pinnæ coalescing, or the terminal pinnæ more or less pinnatifid; lateral pinnæ 5-12, on either side the main rhachis free, serrate or subentire.—*A. pinnatifido-pinnatum*, Hook. Sp. Fil. iii. 238; Hk. & Baker, Syn. Fil. 231. *Diplazium pinnatifido-pinnatum*, Bedd. Ferns Brit. Ind. t. 244.

Mishmee, Griffith; four fronds apparently collected on one occasion.—Distrib. Hongkong, Java.

The Java frond is 18 in., with 12 free pinnæ on either side the main rhachis. The Hongkong fronds are 4-6 in., with 5-6 free pinnæ on either side the main rhachis. Griffith's examples are halfway between the two; and the same fern beyond doubt as mine. As to the long pinnatifid terminal pinna insisted on by Sir W. J. Hooker, two of Griffith's fronds do not show it.—This is very near *A. sylvaticum*, which has more numerous herbaceous pinnæ, crenate or very slightly pinnatifid into obtuse lobes, rather than serrate. Benthams description of *A. sylvaticum*, in Fl. Hongk. 452, seems intended to cover the examples since referred to *A. Lobbianum*.

43. *A. SYLVATICUM*, Presl, Rel. Haenk. i. 42, excl. var. β . Stipes nearly naked; frond oblong-lanceolate; pinnæ numerous, horizontal, the upper scarcely pinnatifid, the lowest pinnatifid $\frac{1}{2}$ rarely $\frac{2}{3}$ the distance to the midrib; sori linear, many diplazioid.—

My fronds are typical specimens, *i. e.* they resemble exactly single pinnæ of *A. latifolium*, Don; they are attached to the caudex, and are very fully fruiting. Wallich's example, marked by his hand *A. soboliferum*, is exactly the same thing, from Chappedong Hill, in Birma; but the number on the ticket (*viz.* 1670) is wrong, and the reference of the specimen to *A. porrectum*, Wall. (Hook. Sp. Fil. iii. 251), seems unusually wide of the mark. This fern appears to me only to be fronds from the young caudex (not young fronds) of *A. latifolium*; G. W. Cat. Ferns Ceylon, 5, appears to distinguish between such 1-pinnate fronds and *A. sylvaticum*; but I do not know how he does it. As to *Diplazium bulbiferum*, Brack. U.S. Explor. Ferns, t. 18. fig. 1, it may be either this or *A. japonicum*, if these two can be kept distinct.

44. *A. TOMENTOSUM*, Hook. Sp. Fil. iii. 249, not of Mett. Caudex 1–2 in., erect from the ground, sending down very wiry black roots; main rhachis pubescent, not tomentose; pinnæ narrow-oblong, falcate, usually auricled at base on the upper margin, entire, or in large fronds pinnatifid halfway to the midrib; sori long, often reaching nearly to the margin.—Hk. & Baker, Sp. Fil. 234. *A. soboliferum*, Wall. Cat. 201, type sheet. *Diplazium tomentosum*, Bedd. Ferns Brit. Ind. t. 195.

Khasia, Griffith (one example).—Distrib. Burma, Malay Peninsula.

This species here stands, as Mr. Baker has left it, on its non-creeping rhizome. Beddome's figure is excellent. On the same caudex are many short-stiped fronds, with sub-entire pinnæ, and often a few long-stiped fronds with pinnæ pinnatifid halfway down. The Indian type is not exactly that of *Diplazium tomentosum*, Blume, Enum. Pl. Jav. Fil. 192; the authentic specimen of which (does not show the rhizome, and may therefore be another species, and) has the pinnæ pinnatifid to the rhachis nearly, and the main rhachis very villous, subtomentose.—The fern of Griffith's referred by Fée to his *Asplenium argutans* (Gen. Fil. 194, 8^{me} Mém. 53) is *A. tomentosum*, Hook.; but it probably has nothing to do with the Bourbon plant, which is Fée's type of *A. argutans*.—The type specimens of Wallich have a rooting penultimate bud.

45. *A. JAPONICUM*, Thunb. Fl. Jap. 334. Rhizome creeping; main rhachis glabrous or pubescent; pinnæ alternate or subopposite, pinnatifid halfway or nearly the whole way to the rhachis into obtuse lobes; veins all simple, or some forked; sori linear, commencing near the midrib, falling short of the margin.—Hk. & Baker, Syn. Fil. 234. *A. Schkurii*, Hook. Sp. Fil. iii. 251, not of Mett., nor of Thwaites. *A. ambi-*

North-west Himalaya; Nepaul, *Wallich*; Nynee Tal, *Edgeworth*, *H. C. Levinge*; Kangra, *Edgeworth*; Kumaon, *Strachey* and *Winterbottom*. Khasia; alt. 3000 feet, abundant, *C. B. Clarke*. Chittagong; alt. 200 feet, common, *C. B. Clarke*.—Distrib. South India and Ceylon, Burma, Malaya, China, Japan, Polynesia.

The distribution and varieties of this fern are puzzling. The North-west Himalayan plant is the same as the typical South-Indian; no other North-Indian examples except these three sheets exist at Kew; but the fern is abundant in East Bengal, whence I have brought in large quantity two Khasi and two Chittagong forms. All these North-Indian forms have a distinctly creeping rhizome, and are (in my judgment) trifling varieties (except var. *chattagramica*). They vary much in size and hairiness: the ordinary Khasi and Chittagong plant is very glabrous; the 2nd Khasi form has the rhachis pubescent, and is altogether more hairy than *A. tomentosum*, Hook.; it has been distributed by me as *A. tomentosum*, Hook., erroneously. Small forms of this much resemble *A. grammitoides*, Hk. & Baker, Syn. Fil. (ed. 2), 491.

Var. *chattagramica*. Frond 2-pinnate; some of the secondary pinnæ subpetioled; sori reaching to the edge, but not commencing from the midrib. (Pl. LXIV. fig. 1.)

Kasalong, Chittagong Hills, *C. B. Clarke*.—Mr. Baker is not willing to place this under *A. japonicum*; but I feel sure, from its variation, that it belongs here. As to the nearly allied forms I may mention, in passing:—

(Var. ?) *Schkuhrii*, (sp.) Thwaites; Hk. & Baker Syn. Fil. (ed. 2), 491, excl. the figure of Bedd. quoted. Large, compound; the secondary pinnæ 3 in., deeply pinnatifid. —*D. decurrens*, Bedd. Ferns South. Ind. t. 229.

Cachar, *R. L. Keenan*.

A. polyrrhizon, Hk. & Baker, Sp. Fil. (ed. 2), 490, only differs from *A. japonicum* in having a non-creeping rhizome. Beddome (Ferns Brit. Ind. Suppl. p. 12) doubts if this distinction can be relied on: I share his doubts. (*A. polyrrhizon* does not approach *A. tomentosum*, Hook.)

Diplazium malaccense, Presl; Fée, Gen. Fil. 213, t. 17 g. The authentic specimen of this is the tip of a very large pinna of *D. latifolium*, Don.

Asplenium Schkuhrii, Mett. Farngatt. Aspl. 182. The authentic specimen marked by Mettenius's hand is *A. sylvaticum*.

Diplazium speciosum, Bedd. Ferns Brit. Ind. t. 290, is said by Beddome to be equal to

Aspl. acuminatum, Wall., and the figure appears made therefrom. This *Aspl. acuminatum*, Wall., I cannot separate from *A. sylvaticum*. But the authentic example of *Diplazium speciosum*, Blume, differs considerably from *A. acuminatum*, Wallich, and appears a good species. At all events *A. acuminatum*, Wall., should be attached to *A. sylvaticum* rather than to *A. speciosum*.

46. *A. STOLICZKÆ*, C. B. Clarke. Caudex very stout, erect, stipes below densely clothed with linear scales $\frac{1}{2}$ –1 in.; pinnæ 2–6 by $\frac{1}{2}$ –1 in., caudate, regularly pinnatifid nearly to the rhachis; sori oblong or linear-oblong, not produced to the margin of the frond.—*A. marginatum*, Wall. Cat. 209, type sheet partly, not of Linn. *A. sorzogonense*, Hook. Sp. Fil. iii. 252, partly; Hk. & Baker, Syn. Fil. 236, partly, not of Presl and Mett. *Diplazium sorzogonense*, Bedd. Ferns Brit. Ind. t. 246. *D. Stoliczkæ*, Bedd. Ferns Brit. Ind. Suppl. 13, t. 361.

Himalaya, alt. 7000–10,000 feet, from Nepaul to Bhotan, in large quantity and gregarious around Darjeeling.

My examples show a greater difference in width of pinna than do Beddome's figures of *A. sorzogonense* and *Stoliczkæ*.—*A. sorzogonense*, Presl, is founded on Cuming's No. 301 (see also Mett. Farngatt. Aspl. 185), a Luzon plant; it is exactly = *A. parallelum*, Wall. Cat. 228, from Penang and Malacca. This is a thoroughly tropical fern, the pinnæ not caudate, the segments obtuse, the sori long, reaching quite to the margin. There is an example of the true *A. sorzogonense* marked "Khasia, Griffith," but without any original ticket. I suspect Griffith collected this at Malacca.—The Javan *A. sorzogonense*, referred to the Luzon plant by Mettenius, differs again somewhat, but may belong; it certainly does not approach the Sikkim *A. Stoliczkæ*.—*A. sorzogonense* β . *majus*, Hook. (Sp. Fil. iii. 252), Hk. & Baker (Syn. Fil. 236), differs totally.—*A. polymorphum*, Wall. Cat. 230, is greatly mixed in the mounting; the Kew Herb. sheet contains a frond of *A. Stoliczkæ*, and another not *A. polymorphum*.

*** *Fronds 2-pinnate, or more compound.*

47. *A. TORRENTIUM*, C. B. Clarke. Caudex erect; stipes nearly glabrous; frond 6–18 in., 2-pinnate very irregularly cut; secondary pinnæ $\frac{1}{2}$ –2 in., pinnatifid $\frac{1}{2}$ – $\frac{3}{4}$ the way to the midrib; sori long; involucre early disappearing. (Pl. LXIV. figs. 2, 3.)

Sikkim, alt. 1500–5000 feet, C. B. Clarke.

Collected on several occasions, always on the margins of torrents, where the caudex stands, from sand between rocks, often several inches out of the ground. The most marked feature in this fern is the very fugacious involucre; I long supposed it a *Gymnogramme*. It is possible that it is a form of *A. latifolium*, Don, growing irregularly in an abnormal situation. The secondary pinnæ vary greatly in size, and in the degree to which they are developed.

48. *A. SIKKIMENSE*, C. B. Clarke. Primary pinnæ 2 feet, resembling in cutting *A.*

polypodioides, but the ultimate segments longer; rhachis of the primary pinnæ rough with small short scales; secondary pinnæ cut down nearly to the rhachis into close, oblong, regular obtuse segments, their rhachises pubescent not squamose; segments $\frac{1}{2}$ – $\frac{3}{4}$ in., crenate-serrate not pinnatifid; veins mostly forked, microscopically pilose; involucres very short, in two oblique rows quite close to the rhachis of the segment. (Pl. LXV. fig. 1.)

Sikkim, *Sir J. D. Hooker*; alt. 500 feet near the Teesta, *C. B. Clarke*.

This fern has been placed with *Allantodia sylvatica*, Blume, has been further named *A. brevisorum*, has been then, with Blume's plant, reduced to *A. umbrosum*, J. Smith. I doubt its being the same with *A. sylvaticum*, Blume; I am quite sure that it is not closely connected with the Himalayan *A. umbrosum* (*A. procerum*, Wall.); and I can find no other example of *A. umbrosum* at Kew approaching it. In *A. sikkimense* a few involucres are diplaziod, all open from the outer edge, *i. e.* are not allantodioid. If the species is not good, I think it must be added as a var. to *A. polypodioides*.

49. *A. POLYPODIOIDES*, Mett. Hort. Fil. Lips. 78. Caudex stout, erect, standing out of the ground; fronds large, ovate, 2-pinnate; secondary pinnæ 2–4 in., cut down nearly to the rhachis; segments $\frac{1}{2}$ – $\frac{3}{4}$ in., short-oblong, obtuse, patent nearly at right angles to the rhachis, entire or crenate-serrate not pinnatifid; veins forked or simple; involucres in two oblique rows in the segments, linear little curved, commencing near the midrib, rarely extending to the margin.—Hk. & Baker, Syn. Fil. 238; Benth. Fl. Austral. vii. 751. *A. polymorphum*, Wall. Cat. 230, in part. *Diplazium polypodioides*, Blume, Enum. Pl. Jav. Fil. 194; Carr. in Fl. Viti. 357; Bedd. Ferns Brit. Ind. t. 293, not Ferns South. Ind. t. 163.

Himalaya, alt. 2000–9000 feet, from Kashmir to Bhotan, very common. Khasia, alt. 2000–6000 feet, very common.—Distrib. Mts. of South. India and Ceylon, Malay Peninsula and Islands, Australia.

Caudex sometimes making a trunk 3–4 feet high.

Var. 1. *typica*. Stipe and main rhachis glabrous.

This is the type of Blume, also in Australia and Ceylon, common in the Himalaya. A Himalayan example of this with linear sori is in the Herbarium marked *Allantodia sylvatica*, Blume, fide Mett.

Var. 2. *vestita*. Stipe and main rhachis often also the partial rhachises paleaceous, as well as villous subtomentose.

This var. seems confined to the Central Himalaya; a large form.

Var. 3. *sublatifolia*. Ultimate segments larger; sori longer, often curved.

North-western Himalaya, alt. 3000–7000 feet.—This series of plants distinctly approaches *A. latifolium*.

Var. 4. *effusior*. Segments of the secondary pinnæ larger, pinnatifid, hence the veins in them subpinnated, and the sori not in two rows but often long.

Sikkim, *Dr. Jerdon*; East Nepaul, *Sir J. D. Hooker*.

The South-Indian *A. asperum* (*Diplazium* of Blume and Beddome) does not occur in North India; Mr. Baker considers it a var. of *A. polypodioides*.

50. *A. MULTICAUDATUM*, Wall. Cat. 229. Rhizome creeping; frond $1\frac{1}{2}$ –3 feet, ovate, glabrous, 2-pinnate; secondary pinnæ pinnatifid nearly to the rhachis, their segments oblique to the rhachis, again serrate or subpinnatifid; involucres oblong or subquadrate near the rhachis, but few diplazioid.—*A. Griffithii*, Hk. & Baker, Syn. Fil. 239. *A. spectabile*, Wall. Cat. 237 A. *Diplazium Griffithii* and *Jerdoni*, Bedd. Ferns Brit. Ind. tt. 327, 328. *Athyrium multicaudatum* and *Griffithii*, Bedd. Ferns Brit. Ind. Suppl. p. 12.

Himalaya, alt. 1000–5000 feet; from Nepal to Bhotan, common. Khasia, alt. 1000–5000 feet, common. Chittagong; alt. 200–2000 feet, frequent, *C. B. Clarke*.

Well separated from the neighbouring forms by its creeping root; the secondary pinnæ also are often caudate.—There are examples marked by Col. Beddome *A. Jerdoni* in the Kew Herbarium which seem to me (and to Mr. Baker) identical with Wallich's *A. multicaudatum*.—The fern is mixed in Herbaria with *A. (Pseudallantodia) bellum* (no. 39, above), which it resembles somewhat in cutting; but it is really more allied (by its non-allantoid sori) with *A. australe*, Brack.

Var. *tristis*. Fronds small, solitary, and distant; cutting lax irregular; sori scattered irregular.

Khasia, alt. 4000 feet, *Griffith*, *C. B. Clarke*.—A frequent Khasi plant, possibly a distinct species, but I can lay hold of no distinctive character.

51. *A. SUCCULENTUM*, *C. B. Clarke*. Rhizome creeping; frond 6–10 feet, succulent; secondary pinnæ 4–6 in., cut down to an undulate winged rhachis; segments $\frac{3}{4}$ in., undulate crenate or scarcely serrate; sori much as in *A. latifolium*, but shorter and smaller. (Pl. LXIV. fig. 4.)

Darjeeling, alt. 7000 feet, *C. B. Clarke*; once collected.

Possibly a var. of *A. latifolium*, Don; but besides the creeping root, it has a cutting not like that of any of the numerous forms of *A. latifolium*. I have shown my specimens to many of the most experienced Indian pteridologists, but no one would ever hazard a name for this. Major Henderson thinks, in spite of its large size, that its true affinity is with *A. japonicum*.

52. *A. LATIFOLIUM*, Don, Prodr. Fl. Nep. 8. Caudex large, erect; fronds large, ovate, 2-pinnate, secondary pinnæ 1–6 in., oblong-lanceolate, those in the upper part of the frond often subentire, those in the lower part pinnatifid $\frac{1}{3}$ – $\frac{2}{3}$ the way down to the rhachis, very rarely more deeply; sori very long, lower often curved and diplazioid.—Hk. & Baker, Syn. Fil. 239. *A. dilatatum*, Hook. Sp. Fil. iii. 258 altogether. *A. diversifolium*, Wall. Cat. 203. *A. polymorphum*, Wall. Cat. 230 A. *A. maximum*, Hk. & Baker, Syn. Fil. 239, exclud. the syn. Bedd.; Benth. Fl. Austral. vii. 751; (not of Don?). *Diplazium dilatatum*, Blume, Enum. Pl. Jav. Fil. 194; Bedd. Ferns South Ind. t. 192.

Himalaya, alt. 2000-9000 feet; from Kashmir to Bhotan very common. Khasia, alt. 1000-5000 feet; common. Chittagong, alt. 200 feet, C. B. Clarke.—Distrib. South India and Ceylon, Burma, Malay Peninsula and Islands, China, Philippines, Australia.

Beddome states (Ferns Brit. Ind. Suppl. p. 13) that he found the Kew bundle of *A. maximum* (a Fern that has always puzzled botanists in India) to consist of a mixture of *A. latifolium* with *A. decurrens*: I concur. What *A. maximum*, Don, Prodr. Fl. Nep. 8, may have been can only be guessed; but from Don's description of the sori I should guess it to have been *A. polypodioides*.—Beddome's *A. decurrens* (Ferns South. Ind. t. 229) is sent me by Thwaites, named *A. Schkuhrii*: it is *A. Schkuhrii*, Thwaites, Hk. & Baker, Syn. Fil. (2nd ed.) 491, excluding the syn. Bedd.; but it is not *A. Schkuhrii*, Hook. Sp. Fil. iii. 251, Hk. & Baker, Sp. Fil. 235, which is *Diplazium Schkuhrii*, Bedd. Ferns South. Ind. t. 230. There are here 3 plants:—

- a. japonicum*, with 1-pinnate fronds.
- β. decurrens*, with 2-pinnate fronds, a secondary pinna of this resembling a primary pinna of *A. japonicum*.
- γ. dilatatum*, with 2-pinnate fronds, secondary pinnæ very large.

How *A. arborescens*, Mett., and several others are distinguishable from *A. latifolium* I do not see.

Var. *frondosa*. Involucres very early disappearing; the plant frequently supposed a *Gymnogramme*; cutting slightly but invariably unlike the typical *A. dilatatum*.

North-west Himalaya to Sikkim.—This is the real *A. frondosum*, Wall. type, which he afterwards arranged as a var. of *A. polymorphum*, Wall. Cat. 230. The sori are often shorter and straight, and become very thick, almost covering the segments in full fruit.

Subgenus VII. *Anisogonium*. Veins copiously anastomosing. Involucres linear or oblong, many placed back to back, dehiscing from their outer edge.

53. *A. HETEROPHLEBIUM*, Mett.; Hk. & Baker, Syn. Fil. 243. Stipes tufted, frond 1-pinnate.—*Anisogonium heterophlebium*, Bedd. Ferns Brit. Ind. t. 329.

East Nepaul to Mishmee; alt. 4000-6000 feet; frequent in Sikkim.

54. *A. ESCULENTUM*, Presl, Rel. Hænk. i. 45. Nearly always bipinnate; sori linear, parallel.—Hook. Sp. Fil. iii. 268; Hk. & Baker, Syn. Fil. 245; Benth. Fl. Hongk. 452. *A. bipinnatum*, Roxb. in Calc. Journ. Nat. Hist. iv. 499. *A. pubescens* and *Moritzii*, Mett. Fil. Hort. Lips. t. 11. figs. 3, 4. *Diplazium malabaricum*, Spreng.; Blume, Enum. Pl. Jav. Fil. 193. *D. esculentum*, Swartz; Carr. in Fl. Viti. 356. *Hemionitis esculenta*, Retz. Obs. vi. 38. *Anisogonium esculentum* and *serampurens*, Presl, Tent. Pterid. 116. *Digrammaria ambigua*, Hk. & Bauer, Gen. Fil. t. 56 c (? of Presl). *Callipteris esculenta*, J. Smith; Bedd. Ferns South. Ind. t. 164.

Bengal Plain, very common; Hindoosthan, much less common. Common at the base of the hills, but rarely ascends 1000 feet.—Distrib. South India and Ceylon, Malay Peninsula and Islands, China.

Young plants sometimes produce 1-pinnate fronds.

Subgenus VIII. *Hemidictyum*. Veins anastomosing obliquely towards the margin of the frond. Involucres linear or oblong, dehiscing from their outer edge, none placed back to back.

55. *A. CETERACH*, Linn. Sp. Pl. 1538. Fronds linear, pinnatifid (or scarcely pinnate) into obtuse lobes, densely covered with brown-red scales beneath.—Hook. Sp. Fil. iii. 273, Brit. Ferns, t. 36; Hk. & Baker, Sp. Fil. 245. *Grammitis Ceterach*, Swartz, Syn. Fil. 23. *Ceterach officinarum*, Willd.; Hk. & Bauer, Gen. Fil. t. 113 A; Milde, Fil. Europ. 94; Bedd. Ferns Brit. Ind. t. 71. *Scolopendrium Ceterach*, Engl. Bot. t. 1244. *Hemidictyum Ceterach*, Bedd. Ferns Brit. Ind. Suppl. p. 13, but not admitted by Presl.

Kashmir, alt. 3000–6000 feet; not common. North-West India, *Edgeworth*.—Distrib. Afghanistan, Western Asia, North-west Africa, Europe.

The Indian plant is identical with the English form, and has no tendency towards the Macaronesian *Ceterach aureum*, Link. The striations of the cell-walls of the pales is marked in this form *aureum* and easily seen; but a similar, though less complete, striation can be made out in the pales of *A. Ceterach* type with a $\frac{1}{4}$ -inch and oblique light.

56. *A. FINLAYSONIANUM*, Hook. Sp. Fil. iii. 271 (syn. excl.), not of Wall. Tufted, pinnate rarely simple, glabrous or nearly so; pinnæ often irregularly sparingly lobed, or the terminal pinna rhomboidal; texture leathery; the veins more obscure and wider apart than in *A. macrophyllum*.—Hook. Ic. Pl. t. 937; Hk. & Baker, Syn. Fil. 245. *A. Hookerianum*, Wall. Cat. 2682, not of Wall. Cat. 7090, nor of Colenso. *Hemidictyon Finlaysonianum*, Moore; Bedd. Ferns Brit. Ind. t. 72.

North and East Bengal, with Assam; alt. 0–3000 feet, very common, especially in the lower Khasi valleys.—Distrib. Malay Peninsula.

Often producing rooting buds from the midribs of the pinnæ near their apex. Variable in size; frond usually 1 foot, sometimes 3–4 feet; 8 feet noted by Sir J. D. Hooker; not rarely reduced to 1½–6 in., quite simple and entire.—The whole of Wall. Cat. 191 (*A. Finlaysonianum*, Wall.) in the large paper set is *A. macrophyllum*, as Moore has found out long ago; there is no admixture whatever. Wallich first named *A. macrophyllum* as *A. integerrimum*, which is figured by Hk. & Grev. Ic. Fil. t. 136. Wallich originally named our present Fern *Asplenium Hookerianum*, Wall. Cat. 2682; but unfortunately he subsequently issued the very different *Asplenium bantamense* under the name *A. Hookerianum*, Wall. Cat. 7090.—The question will arise whether we are not bound to take up the name of *A. Hookerianum*, Wall., for this plant: I trust not. As Wallich issued two different plants under the name *A. Hookerianum*, I think we may pin him down to whichever is now most convenient, and maintain that *A. Hookerianum*, Wall., is our *A. bantamense* and that Wallich did not mean our *A. Finlaysonianum* to be named *A. Hookerianum*.

26. ALLANTODIA, Wall.

Veins reticulating. Involucre oblong, along the primary veins, breaking up irregu-

larly on the back, not dehiscing along an edge.—This differs from *Asplenium* sect. *Anisogonium* and *Hemidictyum* by the sori breaking up on the back, from *Asplenium* sect. *Pseudallantodia* by the reticulated veins. But it is difficult to see why it should be retained as a genus while such sections are made subgenera of *Asplenium*. One fine specimen collected by W. S. Atkinson in Sikkim has most of the involucre allantodioid, but a few distinctly diplazioid, *i. e.* placed back to back and both opening by a clean dehiscence from the edge remote from the vein.

1. *A. JAVANICA*, Bedd. Ferns Brit. Ind. Suppl. p. 13. Tufted; frond 1–4 feet; lower pinnæ often opposite.—*A. Brunoniana*, Wall. Pl. As. Rar. i. 44, t. 52; Hk. & Baker, Gen. Fil. t. 120 A; Hook. Sp. Fil. iii. 275; Bedd. Ferns South. Ind. t. 159; Hk. & Baker, Syn. Fil. 246. *Asplenium javanicum*, Blume, Enum. Pl. Jav. Fil. 175. *A. reticulatum*, Wall. Cat. 188. *A. Brunonianum*, Mett. Farngatt. Aspl. 170. *Hemidictyum*? *Brunonis*, Presl, Tent. Pterid. iii. t. 3. figs. 25, 26.

Nepaul to Bhotan, alt. 4000–7000 feet; frequent. Khasia; Mikir Hills, Simons.—Distrib. Ceylon, Java, Samoa.

27. ACTINIOPTERIS, Link.

1. *A. DICHOTOMA*, Bedd. Ferns Brit. Ind. Suppl. p. 13. *A. radiata*, Link; Hook. Ic. Pl. tt. 975, 976, Sp. Fil. iii. 276; Bedd. Ferns South. Ind. t. 124; Hk. & Baker, Syn. Fil. 246. *Acrostichum dichotomum*, Forskh. Fl. Ægypt. Arab. 184. *A. radiatum*, Roxb. in Calc. Journ. Nat. Hist. iv. 479. *A. australe*, Linn. f. Suppl. 444; Vahl, Symb. i. 84, t. 25. *Asplenium australe*, Swartz, Syn. Fil. t. 3. fig. 1. *A. radiatum*, Swartz; Wall. Cat. 197. *Pteris australis*, Hk. & Grev. Ic. Fil. t. 8. *Pt. radiata*, Mett. Fil. Hort. Lips. t. 15. fig. 6. *Acropteris radiata* and *australis*, Link, Hort. Berol. ii. 56. *Blechnum flabellatum* and *radiatum*, Presl, Tent. Pterid. 103.

Base of the North-west Himalaya, alt. 0–2000 feet, in Kumaon and West Nepaul in the crevices of hot rocks; rare in the Hindoosthan plain, as at Agra, Delhi, and Moradabad.—Distrib. South India and Ceylon, Ava, Cabul and Persia, Arabia, Egypt to Angola and the Zambesi.

28. ASPIDIUM, Swartz.

[This is *Aspidium*, Swartz, only very partially. I follow Hk. & Baker, Syn. Fil., here for convenience of reference, and to avoid printing new names. *Aspidium* (as here treated) excludes the subgenus *Euaspidium* itself, and includes those species which have free or little anastomosing veins, an aspidioid not nephrodioid involucre, and (very frequently) a coriaceous shining texture and spinulose-serrate margin.]

Subgenus I. *Polystichum*. Veins all free.

1. *A. LONCHITIS*, Swartz in Schrad. Journ. 1800, ii. 30. Frond linear, 1-pinnate, tapering at the base; lower pinnæ barren, often reduced to auricles; stipe and lower

surface of the frond more or less scaly; pinnæ very close together, auriculate, falcate, not lobed, coriaceous, shining, spinulose serrate; sori mostly in two rows; involucre denticulate on the margin.—Schk. Krypt. Gew. t. 29; Hook. Brit. Ferns, t. 9, Sp. Fil. iv. 8; Milde, Fil. Europ. 104; Hk. & Baker, Syn. Fil. 250. *Polypodium Lonchitis*, Linn. Sp. Pl. 1548; Engl. Bot. t. 797. *Polystichum Lonchitis*, Roth; Bedd. Ferns Brit. Ind. t. 128.

Kashmir, *Jacquemont*; Sonamurg, alt. 11,000 feet, *H. C. Levinge*.—Distrib. Arctic and Alpine Europe, Asia, and North America.

The single Himalayan specimen at Kew (*Jacquemont*'s) has been marked *A. Lonchitis* by Moore; but others have marked it *A. auriculatum*. *H. C. Levinge*'s example is typical *A. Lonchitis*.

2. *A. LACHENENSE*, Hook. Sp. Fil. iv. 8, t. 212. Frond narrowly linear, 1-pinnate; stipe long, thick, chestnut-coloured, somewhat succulent; pinnæ $\frac{1}{3}$ in., ovate or ovate-oblong, entire or pinnatifid halfway down, scarcely coriaceous, margin crenate-serrate, scarcely spinulose; sori 6–10 to a pinna; involucre slightly denticulate.—Hk. & Baker, Sp. Fil. 250. *Polystichum Lachenense*, Bedd. Ferns Brit. Ind. t. 32.

Sikkim, alt. 13,000–16,000 feet; Lachen, Tungu, Samding, *Sir J. D. Hooker*; alt. 7000–15,000 feet, Jongri to the Ratong, *Dr. T. Anderson*. Kashmir; alt. 13,000 feet, Palgram, *C. B. Clarke*.

Rhizome very scaly; stipes very numerous, thick, rising in a dense mass. Frond in the typical specimens 5 by less than $\frac{1}{2}$ in., the lower pinnæ remote, but soriferous and hardly reduced. Stipe scaly, as is the frond beneath more or less. My Kashmir specimen agrees closely.—There are several loose fronds and scraps of fronds collected by Jerdon placed together here; if they were cut from one rhizome, they indicate a passage from *A. Lachenense* to *A. ilicifolium*, Don.

3. *A. ATKINSONI*, C. B. Clarke. Frond small, linear, 1-pinnate, the base not attenuate; stipes thin; pinnæ $\frac{1}{8}$ – $\frac{1}{4}$ in., ovate, entire, coriaceous, sparingly denticulate, sub-spinulose; sori 1–3 to each pinna; involucre slightly lobulate. *Polystichum Atkinsoni*, Bedd. Ferns Brit. Ind. Suppl. p. 14, t. 362.

Sikkim; Yakla Pass, alt. 10,000 feet, *W. S. Atkinson & C. B. Clarke*; Lachen, alt. 10,000 feet, *Sir J. D. Hooker*. Bhotan, *Griffith*.

Col. Beddome's picture is rather larger than my examples, which have, some of them, the frond in good fruit 1 in. long only. This fern has a small rhizome and slender stipes about as long as the frond, and thus (as well as by its very coriaceous texture) differs considerably from *A. Lachenense*; *W. S. Atkinson* originally called it *Polystichum ilicifolium*, var. *minus* and *minimum*. The rhachis is somewhat scaly, the surface of the frond beneath but very slightly so (in my examples).

4. *A. AURICULATUM*, Swartz, Syn. Fil. 44. Frond linear or linear-lanceolate, 1-pinnate, not attenuated at the base; stipe and lower surface of the frond more or less scaly; pinnæ oblong or narrowly oblong, auricular, falcate, coriaceous, entire or pinnatifid,

or lobed so that the lowest secondary pinna is decurrent but nearly free; sori mostly in two rows; involucre small or large, little denticulate.—Hook. Sp. Fil. iv. 11; Hk. & Baker, Syn. Fil. 251. *Polypodium auriculatum*, Linn. Sp. Pl. 1548.—Burm. Thes. Zeyl. t. 44. fig. 2. *

India, abundant.

There is no doubt that our *A. auriculatum* is the original *P. auriculatum*, Linn., because that is founded on the plate of Burmann. Swartz quotes Linnæus, but also quotes Schkuhr; and Schkuhr's plant is made up of one East-Indian and one West-Indian fern. There is therefore no doubt about the name *auriculatum*; the doubt is merely whether Swartz should be given the credit of placing the Linnæan species in its right genus.

Var. 1. *normalis*, Hook. Sp. Fil. iv. 11, t. 218; pinnæ long lanceolate serrate, hardly spinulose or lobed.—Bedd. Ferns South. Ind. t. 120.

South India and Ceylon.—Not known from Northern India; the single Khasi specimen referred hither by Sir W. J. Hooker is the common Khasi form of var. *cæspitosa*.

Var. 2. *marginata*, Wall. Cat. 366. Pinnæ ovate-oblong, closely spinulose, hardly pinnatifid; texture very coriaceous, shining.—Mett. Farngatt. Pheg. & Asp. 39 (sp.); Bedd. Ferns Brit. Ind. Suppl. t. 363. *A. auriculatum*, Don, Prodr. Fl. Nep. 3.

From Kunawur to Bhotan, alt. 7000–10,000 feet, common.—This fern is often marked *A. Lonchitis* in Indian collections; it has a longer stipe, and the frond much less attenuated at base, the involucre less denticulate. It sometimes has very large involucre, when it is often marked *A. ocellatum*, Wall.; but Wallich seems to have understood by that name *principally* the large-fruited form of var. *lenta*.

Var. 3. *cæspitosa*, Wall. Cat. 367. Pinnæ ovate-oblong, margin scarcely spinulose or serrate, sometimes entire; texture scarcely coriaceous, drying a dark dull green.—Mett. Farngatt. Pheg. & Asp. 39 (sp.); Bedd. Ferns Brit. Ind. t. 33; (sp.) Hook. Sp. Fil. iv. 13, t. 213. *A. obliquum*, Don, Prodr. Fl. Nep. 3.

Khasia, alt. 3000–4500 feet, very common. Himalaya, alt. 4000–8000 feet, from Bhotan to Kunawur.—The Khasi plant is a well-marked type, with the pinnæ hardly serrate; but the North-west forms figured by Beddome show that this var. cannot well be separated from the last.

Var. 4. *lenta*, (sp.) Don, Prodr. Fl. Nep. 4. Pinnæ pinnatifid, serrate, usually spinulose, the lowest segment of the upper limb often nearly free, but decurrent, the remainder of the pinna much less deeply pinnatifid.—Var. *subbipinnata*, Hook. Sp. Fil. iv. 11; Bedd. Ferns Brit. Ind. t. 136.

Throughout the Himalaya and Khasia, very common, especially in Sikkim, Bhotan, Khasia; alt. 1500–8000 feet.—A very uniform series of plants, carrying many names in herbaria: *A. ocellatum*, Wall. Cat. 360; Mett. Farngatt. Pheg. & Asp. 43, is a form of this with larger sori than usual. This fern frequently produces a subterminal rooting bud on the main rhachis; then it is called *Polystichum radicans*.

5. *A. ILICIFOLIUM*, Don, Prodr. Fl. Nep. 3. Frond linear or linear-lanceolate, not attenuated at the base, very coriaceous; both surfaces shining, naked; main rhachis fibrillose; pinnæ subsimple, triangular or lanceolate, deeply lobed; segments ovate or trapezoidal, angles very spinulose mucronate; sori in two rows, usually large.—Hk. & Baker, Syn. Fil. 251. *A. pungens*, Wall. Cat. 368. *A. stimulans*, Kunze; Mett. Farngatt. Pheg. & Asp. 43; Hook. Sp. Fil. iv. 12, t. 214. *Polystichum stimulans*, Presl; Bedd. Ferns Brit. Ind. t. 31.

Himalaya, alt. 7000–11,000 feet; from Chumba to Sikkim, frequent.

The most marked form of this species has the pinnæ simple, triangular or subrhomboidal, very prickly, from being both coriaceous and spinulose; but there is a series of forms with longer more lobed pinnæ, till we come to a var. that is subbipinnate. There is one sheet at Kew with 12 fronds mounted on it, whereof 2 or 3 are *A. aculeatum*, 2 or 3 are *A. ilicifolium*: nobody has hitherto ventured to name the intermediates.

6. *A. THOMSONI*, Hook. Sp. Fil. iv. 7, 2nd Cent. Ferns, t. 25 partly. Frond linear, $1\frac{1}{2}$ –7 in., subcoriaceous, not attenuated at the base, both surfaces more or less fibrillose; pinnæ lobed almost to the rhachis, bristle-serrate, very unequal at base, the lower margin cut away, the upper with a divaricate enlarged lobe; sori terminal (or nearly so) on the veins.—Hk. & Baker, Syn. Fil. 251 partly. *Polystichum Thomsoni*, Bedd. Ferns Brit. Ind. t. 126.

Himalaya, alt. 7000–13,000 feet; from Balti to Sikkim, frequent.

The sheet from which Sir W. J. Hooker founded his *A. Thomsoni* contains specimens collected on three different occasions: two of these are *A. Prescottianum*; one is *A. Thomsoni*. The plate of Hooker cited is compounded from the whole sheet, the single frond being *A. Prescottianum*, the stipe with two fronds *A. Thomsoni*, as is the magnified pinna at the base of the plate. The descriptions of Hook. and of Hk. & Baker are drawn mainly from *A. Prescottianum*. The two species are no doubt very close; but if a line can be drawn and both species retained, it must be where Beddome has drawn it; his figure (cited) is excellent.

Var. *gracilis*. Frond small, margin of the frond crenate-lobate, hardly bristly or serrate.—

Lastrea gracilis, (sp.) Moore; Bedd. Ferns Brit. Ind. t. 198. *Nephrodium sparsum*, var. *gracilis*, Hk. & Baker, Syn. Fil. (2nd ed.) 498.

Sikkim, alt. 11,500 feet.—The type specimen is crenate; but there are fronds on the same rhizome that are bristle-serrate.—The genus of this fern is doubtful. The sorus is terminal or nearly so on the vein; the involucre is round, attached excentrically, the hinder (shorter) portion covering the vein, and having no capsules under it. When the involucre first separates from the frond, its summit appears excentrically concave; i. e. it is (more or less distinctly) polystichoid. But as the capsules under the front portion of the involucre increase in size, the front (larger) portion of the involucre is raised, and it appears nephroid; quite as distinctly so in *Polystichum Thomsoni*, Bedd., as in *Lastrea gracilis*, Bedd. In no form of the present species does the involucre appear distinctly attached lineally along the vein; on the other hand, perhaps, no

species with terminal or subterminal sori is truly polystichoid.—Mr. Benthams has united *Aspidium* and *Nephrodium* of Baker; but when this is done the large series has to be divided into sections somehow. I feel no doubt that *Polystichum Thomsoni*, Bedd., and *Lastrea gracilis*, Bedd., are one species, though it may be an open question in what genus it is to be placed.

7. *A. ACULEATUM*, Swartz in Schrad. Journ. ii. 37. Frond large, lanceolate, bipinnate, coriaceous, not attenuated at the base; stipe paleaceous or fibrillose, firm; segments oblong, unequal at the base, lower margin excised, upper often auriculate; margin bristly or spinulose, not serrated into small lanceolate teeth.—Schk. Krypt. Gew. t. 39; Engl. Bot. t. 1662; Hook. Sp. Fil. iv. 18, Brit. Ferns, tt. 10, 11, 12; Milde, Fil. Europ. 104; Hk. & Baker, Syn. Fil. 252; Benth. Fl. Austral. vii. 757. *Polystichum aculeatum*, Bedd. Ferns South. Ind. tt. 121, 122. *Polypodium aculeatum*, Linn. Sp. Pl. 1552.

Himalaya and Khasia; alt. 2000–13,000 feet; very common. Chota Nagpore; Paras-nath, alt. 3000–4000 feet; *C. B. Clarke*.—Distrib. Mts. of South India and Ceylon, of Burma and Malaya, and throughout the globe nearly.

A great quantity of the North-Indian examples do not differ materially from the European type (Hook. Brit. Ferns, t. 12); the following list of varieties comprises the North-Indian material that differs more or less from *A. aculeatum* type.

- Var. 1. *lobata*, (sp.) Engl. Bot. t. 1563. Fronds narrowly lanceolate; pinnae hardly pinnate, the lower secondary pinnae sessile or decurrent.

Throughout the Himalaya, but much more rare than *A. aculeatum* type.

- Var. 2. *rufo-barbata*, (sp.) Wall. Cat. 369. Frond 2-pinnate, coriaceous, usually reddish; stipe often densely clothed with red scales or fibrillae; frond naked on both surfaces; ultimate segments rhomboidal, resembling closely the cutting of *A. ilicifolium*.—*A. affine*, Wall. Cat. 370; Mett. Farngatt. Pheg. & Asp. 46. *A. squarrosum*, Don, Prodr. Fl. Nep. 4; Mett. l. c.

From Kashmir to Bhotan, common (and in the Nilgherries); but the type form of this var. is not sent from Khasia. This var., however, graduates completely into *A. aculeatum* type on the one side, and very nearly (?) into *A. ilicifolium* on the other.—*A. affine*, Wall. Cat. 370, is identical with *A. rufo-barbatum*, Wall. Cat. 369; Mettenius makes them two species; possibly he had different forms under those Wallichian numbers of which the duplicates are mixed.

- Var. 3. *semifertilis*. Base of the frond fertile, upper $\frac{1}{3}$ barren.

Sikkim.—Not very common; examples of all varieties barren at the base are frequent.

- Var. 4. *mucronifolia*, (sp.) Blume, Enum. Pl. Jav. Fil. 164. Fronds 3-pinnate or sub-3-pinnate.

Khasia and Assam.—The secondary pinnae have the lowest segment on the upper limb free or nearly so. The Khasia and Javan examples are just alike, both varying from narrow-lanceolate to ovate-acute.

Var. 5. *biaristata*, (sp.) Blume, Enum. Pl. Jav. Fil. 164. Secondary pinnæ large, oblong, falcate, sparingly serrate or spinulose; sori often in a line round the margin; texture greenish or blackish green, never red.—Hook. Sp. Fil. iv. 29.

Khasia, common.—The Khasi examples closely agree with those from Burma and Malaya. The large forms of this I cannot distinguish from *A. vestitum*, Presl; Schk. Krypt. Gew. t. 43, cf. Benth. l. c.

Var. 6. *setosa*, Wall. Cat. 371. Lower surface of the frond with long fibrillæ.—*A. discretum*, Don, Prodr. Fl. Nep. 4. *A. polyblepharon*, Kunze, in Bot. Zeit. vi. 572.

Kumaon to Sikkim, alt. 5000–8000 feet, frequent.—This seems to me more worthy specific rank than many other species of *Polystichum* retained by Mr. Baker. The series is not merely defined by being fibrillose on the surface of the frond beneath; the whole set is remarkably uniform in cutting; the frond is large, long-lanceolate; the primary pinnæ numerous, close together, nearly parallel to each other; the secondary pinnæ numerous, close, very distinct, all remarkably like each other. Nor are there any connecting forms between the var. and any other form of *A. aculeatum*.

8. *A. PRESCOTTIANUM*, Wall. Cat. 363. Stipe soft, thick, flaccid, with many pale-straw-coloured scales and fibrillæ; frond narrow-lanceolate, tapering at base, sometimes nearly to the foot of the stipe; pinnæ oblong-lanceolate, not very unequal at the base, deeply pinnatifid, sometimes pinnate, more or less fibrillose on the surface beneath; margin hair-pointed, sometimes serrate, sometimes little-toothed beyond the hairs.—Mett. Farngatt. Pheg. & Asp. 48; Hook. Sp. Fil. iv. 22, t. 223; Hk. & Baker, Syn. Fil. 253. *A. Thomsoni*, Hook. partly, q. v. *Polystichum Prescottianum*, Bedd. Ferns Brit. Ind. t. 34.

Himalaya, alt. 10,000–13,000 feet; from Kashmir to Bhotan, common.

Var. *Bakeriana*, (sp.) W. S. Atkinson, MS. Frond large, broad-lanceolate, truncate at the base, 9–10 in. wide in the typical example; secondary pinnæ 1 in., pinnatifid. (Pl. LXVI.)

Throughout the Himalaya, alt. 10,000–13,000 feet.—The type example of W. S. Atkinson seems very distinct from *A. Prescottianum*, but is connected by intermediates, and I can find no good break.

Var. *castanea*. Stipe round, naked; scales on the rhachis chestnut or blackish chestnut; pinnæ little pinnatifid.

Sikkim, alt. 15,000 feet; *Sir J. D. Hooker*, *W. S. Atkinson*.—This variety runs near some of the examples of *A. Lachenense*, but is very fibrillose on the surface beneath.

9. *A. AMABILE*, Blume, Enum. Pl. Jav. Fil. 165. Rhizome creeping; stipe long, naked or nearly so; frond oblong-lanceolate, truncate at the base, glabrous or nearly so; secondary pinnæ shortly petioled, ovate-oblong, very unequal at the base, serrate, scarcely pinnatifid; sori mostly in a row near the margin.—Hook. Sp. Fil. iv. t. 225; Hk. & Baker, Syn. Fil. 254. *A. rhomboideum*, Wall. Cat. 364; Mett. Farngatt. Pheg. & Asp. 66. *Lastrea amabilis*, Moore; Bedd. Ferns South. Ind. t. 109.

Nepaul, *Wallich*. Jaintea; Jowye, alt. 4000 feet, *C. B. Clarke*.—Distrib. Ceylon, Malaya to the Philippines, South China.

This seems a very rare fern in North India; but it scarcely differs, except by its creeping rhizome, from *A. aculeatum*, var. *biaristatum* forma *Khasiana*. Indeed some examples without rhizomes, referred by Mr. Baker to *A. biaristatum*, have noted on them, by Moore, *amabilis*. The early-collected examples of this species were over-ripe; and Col. Beddome (in his Suppl.) maintains his view that the genus is *Lastrea* rather than *Polystichum*: but the example cultivated at Kew, as well as my Jaintea specimens, leave no doubt that the involucre is strictly polystichoid.

10. *A. ARISTATUM*, Swartz, Syn. Fil. 53. Rhizome shortly creeping or erect; frond large, ovate, acute, 3-pinnate, or sub-3-pinnate, or 4-pinnate, sometimes 5-pinnate, coriaceous, shining, both surfaces naked, margin aristate; sori large or small; involucre aspidioid.—Schk. Krypt. Gew. t. 42; Blume, Enum. Pl. Jav. Fil. 166; Hook. Sp. Fil. iv. 27; Hk. & Baker, Syn. Fil. 255; Benth. Fl. Austral. vii. 757. *A. speciosum*, Don, Prodr. Fl. Nep. 5. *A. conifolium*, Wall. Cat. 341; Mett. Farngatt. Pheg. & Asp. 67. *A. palmipes* and *caruifolium*, Kunze, in Linnæa, xxiv. 287, 292. *A. Maximowiczianum*, Miq. in Ann. Mus. Lugd. Bat. iii. 178. *Polystichum aristatum*, Swartz; Carr. in Fl. Viti. 358. *Polypodium aristatum*, Forst. Fl. Ins. Austr. Prodr. 82. *Lastrea aristata* and *conifolia*, Moore; Bedd. Ferns South. Ind. tt. 101, 261.

Himalaya, from Kumaon to Bhotan, alt. 4000–10,000 feet; abundant in Sikkim. Khasia; alt. 3000–6000 feet, very common.—Distrib. South India and Ceylon, Malay Peninsula and Islands, China, Japan, Australia, and Polynesia.

The caudex is decumbent, curved, with several stipes near the summit in the Himalayan plants: I have seen a more decidedly creeping caudex in the Nilgherries. I have never been able (in the Himalayan plants) to see that the more or less creeping caudex is accompanied by a more or less divided frond, by larger or smaller sori, or by any other of the characters proposed for the subdivision of this species. It seems to me a remarkably uniform plant, the difference between the 3-pinnate and 4-pinnate forms altogether trifling. *A. Cornu-cervi*, Don, Prodr. Fl. Nep. 5, is founded on an unhealthy example collected by Wallich. The two following varieties are better marked:—

- Var. 1. *affinis*, Wall. Cat. 370. Frond 2-pinnate; secondary pinnæ 1–1½ in., oblong, serrate or pinnatifid scarcely halfway down; sori large, not near the margin.—*Lastrea aristata*, β. *Hamiltonii*, Bedd. Ferns Brit. Ind. t. 369.

Nepaul, *Wallich*. Sikkim, *W. S. Atkinson*.

- Var. 2. *assamica*, (sp.) Kuhn, in Linnæa, xxxvi. 108. Frond 2-pinnate; secondary pinnæ 1–2 in., lanceolate, acuminate, serrate or pinnatifid hardly halfway down; sori large.—Hk. & Baker, Syn. Fil. (2nd ed.) 493.

Assam, *Falconer*. Sikkim, *Dodgson*. Jaintea, alt. 4000 feet, *C. B. Clarke*.—This is near the last variety, and runs very close indeed to *A. aculeatum* var. 5. *biaristatum*. I

cannot satisfactorily separate the two: in *A. assamicum* the secondary pinna is divided less unequally by its midrib than in *A. biaristatum*.

Subgenus II. *Cyrtomium*. Veins uniting (sometimes only a few unite close to the margin).

11. *A. CADUCUM*, Wall. Cat. 381. Primary veins from the midrib of the pinnæ repeatedly dichotomous at an acute angle into subequally strong veins, not anastomosing usually till near the margin of the frond, many of them free to the margin.—Hk. & Grev. Ic. Fil. t. 171; Mett. Farngatt. Pheg. & Asp. 35; Hook. Sp. Fil. iv. 39; Hk. & Baker, Syn. Fil. 257. *Cyrtomium caducum*, Presl; Bedd. Ferns Brit. Ind. t. 45. *Polypodium polyodon*, Wall. Cat. 7079.

Himalaya, alt. 4000–7000 feet; from Nepaul to Bhotan, common. Khasia, alt. 3000–5000 feet; common.

Main rhachis sometimes with a subterminal rooting bud. Pinnæ sometimes subentire, sometimes pinnatifid deeply. Sori (in the type) large, in two rows halfway between the rhachis of the pinna and margin; in other cases there is a row (or two rows) of sori close round the margin of the pinna following the sinuosities of the outline; in other cases there are 2–5 rows of sori (rather small) scattered throughout the pinna. The pinnæ are usually narrow-lanceolate, but sometimes broader; not seldom are they broader than in some forms of *A. falcatum*.

12. *A. FALCATUM*, Swartz, Syn. Fil. 43. Primary veins from the midrib of the pinnæ carried nearly straight parallel to each other nearly to the margin, throwing off pinnately 1, 2, or 3 times inarching veins.—Langsd. & Fisch. Voy. Russ. t. 15; Mett. Fil. Hort. Lips. 87; Hook. Fil. Exot. t. 92, Sp. Fil. iv. 40; Hk. & Baker, Syn. Fil. 257. *A. caryotideum*, Wall. Cat. 376; Hk. & Grev. Ic. Fil. t. 69; Mett. Farngatt. Pheg. & Asp. 35; Hook. Garden Ferns, t. 13, Sp. Fil. iv. 40. *A. anomophyllum*, Zenk. Pl. Ind. t. 1; Mett. Farngatt. Pheg. & Asp. 34. *Polypodium falcatum*, Thunb. Fl. Jap. 336, t. 36. *Cyrtomium falcatum* and *caryotideum*, Presl; Bedd. Ferns South. Ind. t. 119.

Himalaya, alt. 3000–8000 feet; from Gurwhal to Bhotan, extending further west than *A. caducum*, but much less common than *A. caducum* eastwards. Khasia, alt. 3000–4000 feet, not common.—Distrib. South India and Ceylon, China, Japan, Polynesia, South Africa.

Usually can be distinguished from *A. caducum* by the broader pinnæ with more numerous rows of sori; the margin also is generally more finely and sharply serrated.

29. NEPHRODIUM, Richd.

Subgenus I. *Lastrea*. Veins free.

* Frond 1-pinnate; pinnæ lobed less than halfway to the midrib, or subentire serrate.

1. *F. CUSPIDATUM*, Hk. & Baker, Syn. Fil. 260. Main rhachis and rhachis of the pinnæ

beneath glabrous or nearly so.—*Aspidium cuspidatum*, Mett. Farngatt. Phleg. & Asp. 92. *Polypodium elongatum*, Wall. Cat. 309; Hook. Sp. Fil. iv. 234. *Lastrea elongata*, Bedd. Ferns Brit. Ind. t. 118.

Khasia, alt. 3000–4000 feet; not rare near Shillong, as at the Bishop's Falls, the Bor Pani, Pomrang. Nepaul, Wallich.—Distrib. Ceylon?

Very red-legged. Rhizome (I believe) wide-creeping; but I omitted either to make a note or to collect an example showing it.—As to the distribution, there is no doubt that the Kew sheet inscribed "Ceylon, Gardner, No. 1256 bis" is *N. cuspidatum* true; but nobody else can find the plant in Ceylon, and the Ceylon collectors doubt whether Gardner got it there: see G. W. Cat. Ferns Ceylon, p. 9, sub *Polyp. acrostichoides*. The same doubt exists as to Wallich's locality; nobody else can find the fern in the Himalaya, and, in several instances, it is certain that Wallich mixed his Khasi and Himalayan specimens (sometimes his Tenasserim and Kumaon specimens) before distributing.—As to the name; the oldest specific name is *elongatum*; but there is a very different fern well known as *N. elongatum*, Swartz or Hk. & Grev., and though this is hardly now admitted as a distinct species, it would be inconvenient to alter back *N. cuspidatum*.

2. *N. HIRTIPES*, Hook. Sp. Fil. iv. 115, t. 249. Main rhachis with long narrow scales, often black; rhachis of the pinnæ beneath squamose; sori not carried into the lobes when the primary pinnæ are pinnatifid; involucre fugacious.—Hk. & Baker, Syn. Fil. 261. *Aspidium hirtipes*, Blume, Enum. Pl. Jav. Fil. 148. *A. atratum*, Wall. Cat. 380; Kunze in Linnæa, xxiv. 279; Mett. Farngatt. Phleg. & Asp. 53. *Lastrea hirtipes*, Bedd. Ferns South. Ind. t. 96.

Himalaya, alt. 5000–9000 feet; from Nepaul to Bhotan, common. Khasia, alt. 4000–6000 feet; common.—Distrib. Burma, Malaya, Polynesia, South India, and Ceylon.

** *Frond 1-pinnate; pinnæ lobed more than halfway to the midrib (but some forms here included, especially N. Filix-Mas, var. odontoloma and cochleatum, are 2-3-pinnate).*

† *Veins in the lobes of the pinnæ mostly simple (but forked veins occur in N. gracilescens, sericeum, and occasionally elsewhere).*

3. *N. GRACILESCENS*, Hook. Sp. Fil. iv. 93. Rhizome shortly creeping or tufted; stipe long, slender, without auricles; frond narrowly oblong-lanceolate, lowest pinnæ little shorter, often deflexed; main rhachis and rhachis of the pinnæ above pilose; pinnæ cut down nearly to the midrib; lobes narrow-oblong, obtuse, little falcate, not very oblique to the midrib, nor much narrower upwards; veins distant, the two lowest terminating above the sinus; sori small, usually near the margin, often plainly visible from above owing to the very thin texture of the frond; involucre small, fugacious, minutely pilose or nearly glabrous.—Hk. & Baker, Syn. Fil. 262. *N. puberulum*, Baker in Trimen, Journ. Bot. 1875, 201. *N. flaccidum*, Hook. Sp. Fil. iv. 133, t. 263; Hk. & Baker, Syn. Fil. 274. *Aspidium gracilescens* and *flaccidum*, Blume, Enum. Pl. Jav. Fil. 155, 161. *A. glanduligerum*, Kunze; Mett. Farngatt.

Pheg. & Asp. 86. *A. Thelypteris*, Benth. Fl. Hongk. 445, not of Desv. *A. angustifrons*, Miq. in Ann. Mus. Lugd. Bat. iii. 178. *Lastrea gracilescens*, Hook. Kew Journ. Bot. ix. 338; Bedd. Ferns Brit. Ind. t. 253. *L. flaccida*, Bedd. Ferns South. Ind. t. 250. *L. immersa*, Bedd. Ferns Brit. Ind. t. 252 (only very partially *Nephrodium immersum*, Hook.).

Nepaul and Sikkim, alt. 6000–8000 feet; not common, C. B. Clarke. Assam; Griffith. Khasia; alt. 4000 feet, plentiful.—Distrib. South India and Ceylon, Java, China, Japan.

The above description applies to all the Kew *N. gracilescens*; Griffith's Assam specimens, referred to *Nephrodium immersum* in Hook. Sp. Fil. iv. 112, are identically the same. Beddome's figure (Ferns Brit. Ind. t. 252) represents Griffith's specimens very well; the Malay true *N. immersum* has very long and narrow segments; the involucres and the texture of the frond differ materially from *N. gracilescens*.—*N. Thelypteris* has a more creeping rhizome, a more glabrous main rhachis, the veins in the segments generally forked. *N. flaccidum*, Hook., has the sinus between the segments of the pinnæ obtuse. *N. puberulum*, Baker, would come between *N. gracilescens* and *N. flaccidum* if there was any space between the two; Col. Beddome has *in litt.* expressed his opinion that there is none.—The Kew bundle of *N. gracilescens* is very homogeneous; the following varieties of my own collection are very difficult:—

Var. 1. *decipiens* (Pl. LXV. fig. 2). Frond shorter, deltoid-lanceolate; veins in the segments frequently branched, the sori subterminal on the upper branch.

Darjeeling, alt. 7500 feet, C. B. Clarke, No. 12,421. Dingling in Khasia, alt. 5000 feet, C. B. Clarke, No. 18,460 D.—This seems to me hardly a variety of *N. gracilescens*, while Mr. Baker objects to its being any way connected with it. In the extreme form the segments of the pinnæ are serrated, the veins becoming subpinnate in each serration.

Var. 2. *hirsutipes* (Pl. LXVII. fig. 1). Stipe hirsute at its foot; frond elongate, stouter in texture than *N. gracilescens* type; sori large, in two rows close to the midrib of the segments; involucres large, pubescent, very persistent.

Khasia and Jaintea, alt. 4000–5000 feet, frequent.—Very constant in all its characters, as in the coarse hair at the foot of the stipe.

Var. 3. *didymochlænoides* (Pl. LXVII. fig. 2). Stipe subglabrous, shining chestnut; sori large, covering the segments entirely; involucres large, persistent, elliptic.

Khasia; Sohra Coalhill, alt. 4300 feet, C. B. Clarke.—The extreme form is more didymochlænoid in the involucre than is much of *Didymochlæna* itself; but this variety is connected by various intermediate forms with the typical *N. gracilescens*.

4. *N. CILIATUM*, C. B. Clarke. Tufted; stipe long, pubescent, without auricles; frond narrowly oblong-lanceolate; lowest pinnæ little shorter, often deflexed; main rhachis and rhachis of the pinnæ above pilose; pinnæ cut halfway down or nearly the whole way down to the midrib; lobes oblong, obtuse, sometimes narrowest upwards, often oblique to the midrib, two lowest veins often terminating close to

the sinus; sori small or medium-sized; involucre pilose, with white hairs.—*N. sericeum*, J. Scott; Hk. & Baker, Syn. Fil. (2nd ed.) 494. *Aspidium ciliatum*, Wall. Cat. 351. *A. canum*, Wall. Cat. 387. *Lastrea sericea*, Bedd. Ferns Brit. Ind. t. 308. *L. nigrescens*, Hook. in Herb., at least in part.

Nepaul, *Wallich*. East Bengal, from Sikkim and Assam to Chittagong; alt. 0–5000 feet, very common.—Distrib. Burma, Malaya, South Deccan, Ceylon.

Scott's original type had very obtuse pinnæ, cut hardly halfway to the midrib, and is figured by Bedd. *l. c.*; this form is only known from Chittagong, alt. 0–200 feet: in my examples the pinnæ are still blunter and less pinnatifid than in Beddome's figure. But the form abundant in Khasia at 4000 feet alt. (and also obtained from Sikkim to Bhotan) has the pinnæ caudate and cut down nearly to the midrib: is *Lastrea Bergiana*, Schlect.; Bedd. Ferns Brit. Ind. Suppl. 16, t. 370; and was Wallich's type. This plant runs very near *N. gracilescens*, var. 2. *hirsutipes*. It is strange that *N. sericeum* has come to be confounded with *N. falcilobum*.

5. *N. FALCILOBUM*, Hook. Sp. Fil. iv. 108. Caudex erect, stout; stipes tufted, nearly invariably auricled; frond lanceolate, narrowed rather suddenly at base into the auricles; main rhachis and rhachis of the pinnæ above pubescent; pinnæ closely pinnatifid nearly to the midrib; segments very oblique, oblong, narrowed upwards, the two lowest veins approaching the margin above the sinus; sori halfway between the midrib and margin; involucre glabrous, subpersistent.—*Lastrea falciloba*, Hook. in Kew Journ. Bot. ix. 338; Benth. Fl. Hongk. 455; Bedd. Ferns South. Ind. t. 105. *Aspidium hirsutulum*, Wall. Cat. 7083, type-sheet example *b*.

By rivers in and near the hills, alt. 0–3000 feet, from North Oude to Mishmee and Chittagong; very common.—Distrib. Burma, China.

I have never seen this fern except by the banks of rivers between their low and high water mark, where it is almost universal, extending from Mymensingh in the plains deep into the Khasi and Sikkim mountains. The caudex is firmly rooted into the sand between the rocks, and usually stands a foot out of the ground.—This fern differs from *N. (Lastrea) calcarata*, Bedd. Ferns South. Ind. t. 246, and from Blume's Javan *N. calcaratum*, in the auricled stipe, the cutting, the venation, the sori, and the involucre.

Var. *pubera*, Wall. Cat. 338. Pinnæ pinnatifid less than halfway to the midrib, more or less auriculate at the base.

Nepaul, *Wallich*.—This name is older than *falcilobum*, but there is another fern *N. puberulum*; and *Aspidium puberum*, Wallich, is a very unusual form of the species, if not distinct from our type, which Wallich placed under *A. hirsutulum*.

6. *N. CANUM*, Hk. & Baker, Syn. Fil. 267. Tufted; stipe auricled; main rhachis hairy beneath; frond elongate, lanceolate, narrowed rather suddenly into auricles at the base; pinnæ pinnatifid deeply; segments oblong, hardly narrowed upwards, not very oblique to the midrib, lowest pair of veins running out at the sinus; sori small, halfway between the midrib and margin; involucre glabrous or pilose, somewhat

fugacious.—*Lastrea cana*, Bedd. Ferns Brit. Ind. t. 307. *Aspidium appendiculatum*, Wall. Cat. 349, type sheet. *A. eburneum*, Wall. Cat. 389, type sheet printed ticket.

Near Simla; Dr. T. Thomson, Edgeworth. Sikkim; Yakla, alt. 8000 feet, C. B. Clarke.

I fear this is only a var. of *N. prolixum*. The pinnæ are without glands at the base, the frond delicate hairy, but I can find no good distinction, and my soft, hairy, larger Khasi *N. prolixum* may be named *N. canum*.—Of *A. appendiculatum*, Wallich collected a large series; the type sheet in his Herbarium is *N. canum*, Baker type; the second sheet in his Herbarium is large *N. canum* verging towards *N. prolixum*, but unusually hairy: the third sheet in his Herbarium has looped veins but no trace of an involucre; it may be *N. extensum*, Hook.: a fourth sheet in Wallich's Herbarium is *Polypodium erubescens*, Hook. Of Wallich's *Aspidium appendiculatum* communicated to Kew, some is *Nephrodium prolixum*, Baker type; some is *N. parasiticum*.

7. *N. ELWESII*, Hk. & Baker, Syn. Fil. 497. Stipe not seen; main rhachis minutely obscurely pubescent; frond 16 by 4½ in., lanceolate, tapering at both ends, glabrous; pinnæ patent, subobtusely, pinnatifid halfway to the midrib; lobes broad, short, obtuse; sori close to the margin; involucre small, fugacious.—*Lastrea Elwesii*, Bedd. Ferns Brit. Ind. Suppl. 18, t. 376.

Sikkim; H. J. Elwes, once collected.

Less cut down than any other species of the section. The whole material is one frond, without base or stipe, but it seems a new species.

8. *N. PROLIXUM*, Hk. & Baker, Syn. Fil. 268. Tufted; stipes long, almost invariably auricled; frond lanceolate, somewhat suddenly narrowed at the base into the auricles; main rhachis hairy at least on the upper surface of the frond, often with glands at the base of the pinnæ; pinnæ cut down nearly to the midrib; segments oblong, often falcate, but not very oblique to the midrib; sori small or medium-sized, involucre glabrous.—*N. oethodes* and *appendiculatum*, Hook. Sp. Fil. iv. 109. *Aspidium prolixum*, Willd. Sp. Pl. v. 251. *A. glanduliferum*, Wall. Cat. 347. *A. appendiculatum*, Wall. Cat. 347, partly; Mett. Farngatt. Pheg. & Asp. 81, not of Blume. *A. oethodes*, Kunze in Linnæa, xxiv. 282; Mett. Farngatt. Pheg. & Asp. 82. *A. xylodes*, Kunze in Linnæa, xxiv. 281. *Lastrea oethodes* and *tylodes*, Bedd. Ferns South. Ind. tt. 106, 107.

Himalaya, from Kashmir to Bhotan; alt. 2000–8000 feet, very common. Khasia; alt. 2000–5000 feet, very common.—Distrib. South India, Ceylon, Mauritius and Bourbon, Burma.

The large Sikkim *N. prolixum* has fronds 4–6 feet long; the sori are either near the midrib or the margin of the segments; the frond is usually nearly glabrous beneath, sometimes hairy. There are smaller, more hairy forms, in Khasia, sometimes but 1 foot long, and running (I fear) into *N. canum*. The most marked form is a small rigid plant

very glabrous beneath, sori larger and involucre firmer. This is considered by Beddome a var. of *N. canum*, has been marked by Sir W. J. Hooker nov. sp. near *N. falcilobum*, but is referred to *N. prolixum* by Mr. Baker, as it usually shows glands at the foot of the pinnae. It is exceedingly like *N. falcilobum* in habit, but has the main rhachis glabrous on the underside of the frond, also the two lowest veins approach the margin at the sinus, not above it. It differs from *N. canum* in its rigid texture and larger sori, but in size and outline approaches it. I have collected this plant in Chumba, in Sikkim, and in Khasia.—Some of the large Khasi varieties have the lowest segment of each pinna more developed, subpinnatifid, and consequently the veins in it forked.

* †† Veins in the lobes of the pinnae (or many of them) forked.

9. *N. THELYPTERIS*, Desv. in Mém. Soc. Linn. vi. 257. Rhizome slender, creeping; frond long, lanceolate, truncate at the base, texture thin herbaceous; sori near the margin of the segments which are (when dry) recurved; involucre small, inconspicuous.—Hook. Brit. Ferns, t. 13, Sp. Fil. iv. 88; Hk. & Baker, Syn. Fil. 271. *Acrostichum Thelypteris*, Linn. Sp. Pl. 1528. *Aspidium Thelypteris*, Swartz; Schk. Krypt. Gew. t. 52; Milde, Fil. Europ. 116. *Lastrea Thelypteris*, Bedd. Ferns Brit. Ind. t. 44.

Kashmir; Bandipoor, Jacquemont, T. Thomson; City Lake, alt. 5600 feet, H. C. Levinge. Kunawur; alt. 6000 feet, T. Thomson.—Distrib. South Deccan Mts., Europe, North Asia, North America; Cape Colony, New Zealand.

The Kashmir examples agree exactly with the European type. Khasia is given as a locality by Sir W. J. Hooker on the authority of No. 246 of Hook. f. & Thoms. collection, which is *N. gracilescens*. I altogether doubt the plant growing in Khasia, though Beddome states his t. 44 (which is true *N. Thelypteris*) to be taken from a Khasi example.—As to *Lastrea Fairbankii*, Bedd. Ferns Brit. Ind. t. 254, reduced by himself, in Ferns Brit. Ind. Suppl. p. 16, to *N. Thelypteris*, I find no authentic example at Kew; but the figure of *N. Fairbankii* shows no forked veins, is said to be taken from a Pulney specimen, where it is very improbable the plant grows, and does not suit *N. Thelypteris* either as to the cutting or reduced approximate lower pinnae. From the figure, I should judge *N. Fairbankii* to be either the reduced small form of *N. prolixum* considered "nov. sp. near *falcilobum*" by Sir W. J. Hooker, or *N. Beddomei*, Baker, if these two really differ.—Nearly all authors quote (for *N. Thelypteris*) Engl. Bot. t. 1018; Sir W. J. Hooker has written in pencil over that plate in the Kew Library "is *P. Phegopteris*!" and Newman (Brit. Ferns, 124) is of the same opinion. The plate (t. 1018) is a very poor one, and does not show the characteristic outline of *Thelypteris*; the sori appear naked, the veins are all simple. I yet suspect that it is really an imperfect representation of *Thelypteris*, for in the magnified pinnule there are shown two aspidioid indusia.

10. *N. APICIFLORUM*, Hook. Sp. Fil. iv. 122, t. 248. Stipe manifest; main rhachis beneath with many lanceolate and ovate scales often lacerate, but without fibrillæ or

long hairs; frond lanceolate, not decurrent on the stipe; secondary pinnæ oblong very obtuse, entire, with the texture and veins of *N. Filix-Mas*, destitute of fibrillæ and hairs; sori often collected towards their extremities; involucres firm, many strictly aspidioid.—Hk. & Baker, Syn. Fil. 271. *Aspidium apiciflorum*, Wall. Cat. 345; Mett. Farngatt. Pheg. & Asp. 54. *Lastrea apiciflora*, Bedd. Ferns Brit. Ind. t. 40.

From Nepaul to Bhotan, alt. 7500–11,000 feet; abundant.

The sori are sometimes restricted to the apex of the segments, but are more often scattered, and in many specimens the sori are near the base of the lobes, none at the apex. The species nevertheless appears a good one, being remarkably free from fibrillæ and hairs, though with many scales; and the involucres far less nephrodioid than in any varieties of *N. Filix-Mas*. The fronds vary in size from 4 feet at 7500 feet alt. to 5 in. at 11,000 feet.

Var. *Nidus*. Tufts very circular; sori usually scattered, but sometimes showing a tendency to be apicifloral, segments somewhat undulate crenate.—Hk. & Baker, Syn. Fil. (2nd ed.) 498; Bedd. Ferns Brit. Ind. Suppl. 17, t. 372. *Aspidium adnatum*, Blume, Enum. Pl. Jav. Fil. 162.

Sikkim, alt. 9000–12,000 feet, abundant. Java.—W. S. Atkinson and Thwaites maintained from the first collection of this fern that it was a var. of *N. apiciflorum*. Thwaites wrote to me “scarcely a var.,” Beddome, however, makes it a var. of *N. Filix-Mas*, Baker of *N. odontoloma*. I have not a shadow of a doubt that Thwaites and W. S. Atkinson are right. My material is very large, and I have walked through the fern for many years.

11. *N. CLARKEI*, Hk. & Baker, Syn. Fil. (2nd ed.) 497. Fronds forming a circular tuft, narrow-lanceolate, tapering much at the base so that there is hardly any stipe; main rhachis beneath with many linear scales, but scarcely fibrillose or hairy; secondary pinnæ oblong, entire, with the texture and veins of *N. Filix-Mas*, destitute of fibrillæ and hairs, the obtuse apex with a distinct hyaline margin.—*Lastrea Filix-Mas*, var. *Clarkei*, Bedd. Ferns Brit. Ind. Suppl. 17, t. 371. *L. fusiformis*, W. S. Atkinson, MS.

Sikkim, alt. 9000–11,000 feet; east, west, and north.

Varies from 5 in. to 3 feet. Tolerably distinct from *N. Filix-Mas* by the very tapering base of the frond and the hyaline entire margin to the apex of the segments. It runs near *N. patentissimum*, Wall., var. *fibrillosa*, which differs by having the surface of the segments beneath fibrillose, their apex serrate not hyaline.

12. *N. SYRMATICUM*, Hk. & Baker, Syn. Fil. 272. Frond large, lanceolate, glabrous or nearly so, 1-pinnate; pinnæ cut down $\frac{1}{2}$ to $\frac{5}{8}$ the way to the midrib; segments elongate, crenate or subentire, a small glandular tooth in the sinus between each two segments; sori small or medium-sized.—*N. spectabile*, Hook. Sp. Fil. iv. 115. *N. pteridioides*, Griff. in Herb. *Aspidium syrmaticum*, Willd. Sp. Pl. v. 237. *A. spec-*

tabile, Blume, Enum. Pl. Jav. Fil. 158; Mett. Farngatt. Phæg. & Asp. 112.
spectabilis, J. Smith; Bedd. Ferns South. Ind. t. 108.

Sikkim, Assam, Khasia, at the foot of the hills; not common, and rarely met with above 2000 feet alt.—Distrib. South India, Ceylon, Burma, Malaya, China to the Philippines.

13. *N. FILIX-MAS*, Richd.; Hook. Sp. Fil. iv. 116 syn. incl. except *δ. cochleatum*. Stipes tufted, manifest; main rhachis with linear-lanceolate scales; frond oblong-lanceolate, usually narrower towards the base, but not attenuate into the stipe, firm in texture, 1-pinnate, almost 2-pinnate; secondary pinnæ oblong, obtuse, serrate or subentire, without fibrillæ or hairs beneath (except in var. *fibrillosa*); involucres prominent, reniform, glabrous.—Hook. Brit. Ferns, t. 15, Fil. Exot. t. 98; Hk. & Baker, Syn. Fil. 272. *Polypodium Filix-Mas*, Linn. Sp. Pl. 1551. *Aspidium Filix-Mas*, Swartz, Schk. Krypt. Gew. t. 44; Engl. Bot. t. 1458; Mett. Farngatt. Phæg. & Asp. 55; Milde, Fil. Europ. 118. *A. cristatum*, Engl. Bot. t. 1949.

Himalaya and Khasia, alt. 3000–12,000 feet; abundant, including the numerous Indian forms.—Distrib. South India and Ceylon. Malaya. Nearly throughout the world in cool and temperate places: not in Australia nor in America south from Peru.

The above diagnosis is designed to include various North-India forms difficult to separate from the ordinary European *N. Filix-Mas*, *i. e.* the first 4 varieties following:—

- Var. 1. *panda* (Pl. LXVIII. fig. 1). Stipe round, firm; frond nearly glabrous beneath, the main rhachis with a few ovate scales; frond narrowly oblong, the lowest pair of pinnæ but one often as long as any above, the lowest pinnæ usually but little shorter; pinnæ pinnatifid $\frac{1}{3}$ – $\frac{2}{3}$ the way to the midrib; segments subspinulose, serrulate.

Dhurmsala, alt. 10,000–11,000 feet, *C. B. Clarke*; North-west India, *Edgeworth*.—Some of the European var. *cristata* approach this, but have a wide sinus between the segments: in var. *panda* it is narrow. Sir J. D. Hooker collected at Lachen in Sikkim, alt. 9000–10,000 feet, a fern which seems a luxuriant form of *panda*.

- Var. 2. *normalis* (Pl. LXVIII. fig. 2). Stipe and main rhachis very sparsely scaly, without hairs or fibrillæ; frond oblong-lanceolate or ovate-lanceolate, the lowest pinnæ often nearly or quite the largest, nearly or quite glabrous beneath; pinnæ falcate, cut down nearly or quite to the midrib, lowest pinnæ unequal-sided, having the pinnules of the lower limb more developed; segments usually sharply serrulate; sori small for *N. Filix-Mas*.

Sikkim, alt. 4000–7000 feet; Khasia, alt. 4000–5500 feet; not very common. This approaches some forms of var. *elongata* and also some forms of *N. sparsum*, Don, which has not so serrate a margin.

- Var. 3. *khasiana* (Pl. LXIX. fig. 1). Stipe and main rhachis with many linear blackish scales; frond oblong-lanceolate, very little narrowed at base; pinnæ approximate, patent, the lowest equal-sided, cut down to the midrib; secondary pinnæ narrowly oblong, very close and regular, glabrous beneath, rounded, finely serrulate at the apex; sori not large.

Khasia, alt. 4000–6000 feet, common.—This is the fern described by Milde, Fil. Europ. 122, lines 3–6 from bottom of page. It is, as Milde states, allied to var. *patentissima*: but, on the other hand, very near *N. elongatum*, Hk. & Grev. Ic. Fil. t. 234; *Aspidium elongatum*, Milde, Fil. Europ. 124.

Var. 4. *patentissima*. Stipe shaggy, with linear yellowish pales often $\frac{1}{2}$ – $\frac{3}{4}$ in. long; frond 4–6 feet, narrowly oblong-lanceolate, widest near the middle, suddenly narrowed near the base; pinnæ patent, very coriaceous, cut down nearly or quite to the midrib; segments oblong, obtuse, subentire or minutely serrulate, glabrous beneath, the margin much incurved when dry.—*A. patentissimum*, Wall. Cat. 340. *Aspidium paleaceum*, Don, Prodr. Fl. Nep. 4. *A. Wallichianum* and *Donianum*, Spreng. Syst. iv. 104 and Suppl. 320.

Bhotan to Simla, alt. 6000–9000 feet, common. Khasia, alt. 5000 feet.—This is an exceedingly fine fern, distinguished among other things by its excessively coriaceous texture. There is a North-west, much smaller form of var. *patentissima* with darker scales.—The South-Indian plant *Lastrea patentissima*, Bedd. Ferns South. Ind. t. 111, agrees with the Javan plant communicated as *Aspidium uliginosum*, Blume; it has the texture and venation of *N. Filix-Mas* and seems to me nearer *N. Filix-Mas* type than to Wallich's *N. patentissimum*. There are also in the Central Himalaya a number of large forms between fine *N. Filix-Mas* and *N. elongatum*, several of which are usually marked *N. patentissimum*.

Var. 5. *fibrillosa* (Pl. LXX.). Stipe 1–3 in.; frond 8–30 in., very narrow, tapering at both ends, but not attenuated with auricles into the stipe; stipe and main rhachis densely clothed with lanceolate-linear, chestnut-coloured scales; pinnæ patent, cut down to the midrib; segments oblong, obtuse, serrulate at the apex, fibrillose on the surface beneath.

North-west Himalaya, alt. 9000–12000 feet, from Kumaon to West Kashmir; very common.—One of the most uniform varieties of *N. Filix-Mas*, and the most worthy consideration for specific rank. It resembles *N. affine*, Lowe, in outline, but differs in indumentum. It has always been known as “the small North-west *patentissima*,” but it seems to me, at least, as near *N. Clarkei*.

Var. 6. *Schimperiana* (Pl. LXIX. fig. 2), (sp.) Hochst.; Mett. Farngatt. Pheg. & Asp. 63. Stipe and main rhachis with lanceolate, straw-coloured yellow or reddish-brown scales; frond (when well developed) fully 2-pinnate; sori very large.—*Lastrea intermedia*, Bedd. Ferns Brit. Ind. t. 113 (small 1-pinnate form).

Himalaya, alt. 7000–11,000 feet, very common. Khasia, alt. 5000–6500 feet, very common.—Distrib. South India, Abyssinia.—This is the high-level, large-fruited species well known to Indian botanists, and very often (and very erroneously) marked by them *N. cochleatum*, which see. Its true affinity, as Col. Beddome has written to me, is with the Indian var. *marginata*; but I find little difficulty in sorting the two. The common form in the East Himalaya is 1-pinnate, as figured by Bedd., and not much like *marginata*: the West-Himalayan form (which is identical with Hochstetter's Abyssinian authentic

plant) is indeed compound, but the sori are large, the rhachis scaly. This plant has also been called in India *N. maderense*, Lowe; but it does not resemble that plant except in being a large-fruited var. of *N. Filix-Mas*. The less compound forms of var. *Schimperiana* run near var. 1. *panda*.

Var. 7. *marginata* (Pl. LXXI.), Wall. Cat. 391, mainly, but not type sheet. Frond large, oblong- or ovate-lanceolate, not narrowed at the base, 2-3-pinnate; lowest pinnæ often 12 in., falcate; main and partial rhachises nearly free from scales; tertiary pinnæ oblong, obtuse, serrate or pinnatifid sometimes nearly to the midrib; texture, venation, and sori nearly as in *N. Filix-Mas*.

Himalaya, alt. 6000-9000 feet, from Bhotan to Kumaon, common in Sikkim. Khasia, alt. 5000 feet.—This fern is called var. *elongatum* in the Kew bundles and also by Indian collectors; but I do not see that it is much like *N. elongatum*, Hk. & Grev. Ic. Fil. t. 234 (*Aspidium*, Milde, Fil. Europ. 124), which is founded on a Macaronesian fern that seems to me much more like var. *khasiana*. The so-called Indian *elongata* is also attributed to the North-west Himalaya; but the specimens so marked by Mr. Baker are marked *Aspidium rigidum*, Swartz, *β. australe* by Mettenius: they appear to me absolutely identical with common English forms of *N. remotum*, Hook.; but I do not say Mr. Baker is wrong in thinking this undistinguishable from *A. marginatum*, Wall. Another plant frequently collected in Khasia has the ultimate segments wide apart with more serrate margin; this runs very near the South-Indian plant *Lastrea elongata*, Bedd. Ferns South. Ind. t. 112, which, again, Mettenius has marked *Aspidium canariense*, A. Braun.

14. *N. ODONTOLOMA*, Hk. & Baker, Syn. Fil. (2nd ed.) 498, excl. the fig. of Bedd. cited and the var. *nidus*. Stipe 6 in., soft, thick, chestnut-coloured, with scattered, deciduous, lax, lanceolate, black pales; frond 10 by 6-8 in., oblong-lanceolate, truncate at the base; pinnæ often widened at the base, 2-pinnate; secondary pinnæ elliptic-oblong, obtuse, pinnatifid (sometimes deeply); segments rounded, sharply serrate; texture thin, becoming hyaline towards the margin, venation subflabellate; involucre fimbriate.—*Lastrea Filix-Mas*, var. *odontoloma*, Bedd. Ferns Brit. Ind. Suppl. 17, t. 373.

Himalaya, from Chumba to Bhotan, alt. 11,000-16,000 feet; common.

A most lovely fern. I have some difficulty in naming it: Beddome's original *L. odontoloma*, Ferns South. Ind. t. 114, is not very near the Himalayan plant, and Beddome has withdrawn that plate (in his Suppl. p. 17). The plate in Suppl. t. 373 is the true plant, but drawn from a high-level scrap: my description above represents the fairly developed average frond; I have examples much larger still. I do not think it runs into any form of *N. Filix-Mas*; the venation is very unlike the forked venation of *N. Filix-Mas*. Though this fern is so common and I have collected 40 sheets of specimens from Chumba to Bhotan, I find only scattered scraps in the Kew Herbarium.

15. *N. COCHLEATUM*, Don, Prodr. Fl. Nep. 6. Fertile and barren fronds distinctly dissimilar, though barren fronds partially fruit-bearing are not rare; main rhachis

firm, without scales; secondary pinnæ in the fertile frond oblong, obtuse, their surface almost completely covered by the large sori with persistent involucres.—*Lastrea cochleata*, Bedd. Ferns South. Ind. t. 115. *Arthobotrys macrocarpa*, Wall. Cat. 395. *A. Avana*, Wall. Cat. 1034.

Dry forests at the foot of the hills, alt. 0–4000 feet, very common; from Oudh to Assam, Khasia and Chittagong. Chota Nagpore; Parasnath, alt. 3000 feet, *C. B. Clarke*.—Distrib. Ava, Malay Peninsula. Mts. of South India.

This fern has been confused with *N. Filix-Mas*, var. *intermedia*, Bedd., and var. *Schimperiana*, Hochst. It resembles that fern in having large involucres. Its especial character is its strong dimorphism; it is worthy, perhaps, generic rank. *N. lacerum*, Hk. & Baker, Syn. Fil. 273, may be the immediate ancestor of *N. cochleatum*. Fragments of the fertile frond are easily separated from *N. Filix-Mas*, var. *Schimperiana*, by the very firm, glabrous, round rhachis, a character noticed by Don. Beddome (in Ferns Brit. Ind. Suppl. p. 17) speaks of having found forms intermediate between *N. cochleatum* and *N. Filix-Mas*, var. *elongatum*; there are none such at Kew, nor have I ever met such in India.—There are examples of *N. cochleatum* marked as collected at 7000 feet alt. even in Kumaon; but the fern is confused with *N. Filix-Mas*, var. *Schimperiana*, and I very strongly suspect that collectors have mixed the two often before distribution: I altogether doubt high-level localities assigned *N. cochleatum*.

*** *Frond nearly or quite 2-pinnate, ultimate segments rounded.—High-level ferns with abundant reddish or blackish scales.*

16. *N. BRUNONIANUM*, Hook. Sp. Fil. iv. 113, t. 251. Main rhachis beneath blackish chestnut, with many lanceolate-linear black-chestnut scales, otherwise glabrous; pinnæ pinnatifid or scarcely pinnate, often subobtuse; sori marginal or near the sinus, not along the midrib of the secondary pinnæ.—Hk. & Baker, Syn. Fil. 274. *Aspidium Brunonianum*, Wall. Cat. 344; Mett. Farngatt. Pheg. & Asp. 54. *Lastrea Brunoniana*, Bedd. Ferns Brit. Ind. t. 37.

Himalaya, alt. 11,000–16,000 feet; from Kashmir to Bhotan, plentiful.

17. *N. BARBIGERUM*, Hook. Sp. Fil. iv. 113. Main rhachis beneath yellowish, with many lanceolate-linear, yellowish-red scales, and also muricate, scabrous, or hairy; secondary pinnæ usually distinct, sometimes subpinnatifid; sori approximate to their midrib.—*N. Falconeri*, Hook. Sp. Fil. iv. 123, t. 254. *N. barbigerum* and *Falconeri*, Hk. & Baker, Syn. Fil. 274, 277. *Lastrea barbigerum* and *Falconeri*, Bedd. Ferns Brit. Ind. tt. 227, 241.

Himalaya, alt. 11,000–15,000 feet; from Kashmir to Sikkim, plentiful.

J. Scott, at Calcutta, strongly suspected that *N. barbigerum* and *Falconeri* were the same fern; Bedd. Ferns Brit. Ind. Suppl. p. 17 arrives at the same conclusion, after seeing the solitary frond on which Sir W. J. Hooker founded his *N. Falconeri*; the two are to me identical.

**** *Frond 2-8-pinnate, 3-4-pinnatifid, small or medium-sized; involucre persistent*
(*N. sparsum* and others sometimes large).

18. *N. RIGIDUM*, Desv.; Hook. Brit. Ferns, t. 16, Sp. Fil. iv. 120; Hk. & Baker, Syn. Fil. 275. *N. pallidum*, Bory, Fl. Peloponn. 67, t. 38. *Aspidium rigidum*, Swartz; Schk. Krypt. Gew. t. 38; Engl. Bot. Suppl. t. 2724; Milde, Fil. Europ. 126.

North-west Himalaya, alt. 6000-8000 feet; from Kashmir to Kumaon, frequent.—Distrib. Cabul, Caucasus, Europe. California?

I attempt no diagnosis in words to separate this fern from *N. spinulosum* and *N. Filix-Mas*, nor do I express any opinion whether it is a good species. I merely say that numerous Indian specimens coincide so closely with English and South-European authentic examples (and with the pictures cited), that I cannot detect the slightest difference. Some of the Indian examples exhibit the whitened appearance of *N. pallidum*, Bory; and Sir W. J. Hooker has written that name on one Indian example. Some forms included by me under *N. Filix-Mas* var. 2. *normalis* above become 2-pinnate, and I can draw no line between them (Khasi examples) and *N. rigidum*.

19. *N. REMOTUM*, Hook. Brit. Ferns, t. 22. *N. spinulosum*, Desv. var. γ , Hk. & Baker, Syn. Fil. 275. *A. remotum*, A. Braun; Mett. Fil. Hort. Lips. 93; Milde, Fil. Europ. 125. *A. eburneum*, Wall. Cat. 389. *Lastrea spinulosa*, Bedd. Ferns Brit. Ind. t. 336.

Kashmir to Nepaul, alt. 6000-9000 feet; frequent.—Distrib. Northern and Alpine Europe, Asia and America.

The typical plant figured by Sir W. J. Hooker is frequent in the West Himalaya; and there are others, slightly different in the cutting, marked by Mettenius *Aspidium rigidum*, Swartz, var. *australis*. These plants are usually named in Indian collections "*Lastrea elongata*"; I do not see that they are at all like the true *L. elongata* of Hk. & Grev., and they are easily separable from *N. Filix-Mas* var. *marginata*, Wall.

Var. *Chanterix*, Moore, MS. Ultimate pinnæ short-oblong, standing apart a distance equalling $\frac{2}{3}$ their own breadth.

Sikkim, Lachen, alt. 11,000 feet; Sir J. D. Hooker.—Moore's specimen from the Chelsea Garden might, so far as I can see, have been cut from the same rootstock as the Sikkim frond: there is no other in the Kew bundles like it.

20. *N. SPARSUM*, Don, Prodr. Fl. Nep. 6. Rhizome short, densely covered with lanceolate-linear reddish or yellow pales; stipe with scattered ovate yellowish caducous pales; main rhachis glabrous or nearly so; frond ovate, 2- or 3-pinnate, lowest pinnæ unequal, the secondary pinnæ on the lower side larger, often falcate; ultimate segments oblong or somewhat trapezoidal, crenulate coarsely, hardly serrate, texture coriaceous; sori large.—Hk. & Baker, Syn. Fil. 276. *N. purpurascens*, Hook. Sp. Fil. iv. 132, t. 262. *Aspidium purpurascens*, Blume, Enum. Pl. Jav. Fil. 169. *A. densum*, Wall. Cat. 390; Mett. Farngatt. Pheg. & Asp. 65. *A. Weigleanum*,

Kunze in *Linnaea*, xxiv. 284. *A. catophorum*, Kunze in *Bot. Zeit.* vi. 262. *Lastrea sparsa*, Bedd. Ferns Brit. Ind. Suppl. t. 375 (var. *obtusissima*). *Polypodium oppositum*, Wall. Cat. 7080.

Himalaya, alt. 3000–9000 feet, from Gurwhal to Bhotan, very common eastward. Khasia, alt. 2000–6000 feet; very common.—Distrib. South India, Ceylon, Burma, Malaya, China, Mauritius.

A large series of ferns is collected under this name: the above description includes the commonest Sikkim and Khasia plant, which I have taken as type; the frond is commonly 1–2 feet long. Besides the difficult varieties of North India described below, Ceylon supplies a different set of forms: according to G. W. (Cat. Ferns Ceylon, p. 6) *N. undulatum*, Hk. & Baker, Syn. Fil. 276 (*Lastrea*, Bedd. Ferns South. Ind. t. 271), should be reduced hither. As to Beddome's figure of *N. sparsum* type (Ferns South. Ind. t. 103) it is correct in outline, but the artist has shown the margin sharply serrate, almost spinulose; it is an especial character of all the North-Indian *N. sparsum* that the margin is not acutely serrated.

Var. 1. *nitidula*, Wall. Cat. 392. An alpine small red-legged form, often only 2–4 in. long; involucre deciduous.—Bedd. Ferns Brit. Ind. t. 374.

Nepaul to Bhotan, alt. 9000–12,000 feet, frequent.—Beddome has figured rather a large specimen resembling Wallich's type plant, which has more persistent involucres and is nearer *N. sparsum* type; but there is no line between this and *N. sparsum* type.

Var. 2. *latisquama*. Rhizome somewhat elongate, clothed with ovate adpressed scales, without any red lanceolate-linear densely tufted hairs at the base of the stipe.

Khasia.—Very similar plants are communicated from Ceylon and Java, and Col. Beddome has marked this for me as the type of Blume's *A. purpurascens*, which it very likely may be; but it is not exactly Don's Nepaul type.

Var. 3. *squamulosa*. Stipe with linear (or lanceolate-linear) permanent pales; main and partial rhachises of the frond with black pubescence and very short linear scales; frond often very compound.

Khasia, alt. 3000–5000 feet, common.—In Sikkim there is a large plant, the frond often 3–4 by 2–3 feet, which I consider to be merely a fully developed form of this; it is very common and marked so many diverse names in the Herbarium, that I consider no one worth quoting.—Major Henderson thinks this var. should have specific rank.

Var. 4. *minor*, Bedd. Ferns Brit. Ind. Suppl. p. 17. Fruiting-fronds 3–6 by 1½–2 in.; pinnæ simple or subpinnate at the base only.—Hk. & Baker, Syn. Fil. (2nd ed.), 498.

Simla, *Edgeworth*. North Cachar, Col. *Godwin-Austen*. Ceylon, *Thwaites*.—Edge-worth's example agrees exactly with Thwaites'.

21. *N. CRENATUM*, C. B. Clarke. Rhizome with a tuft of golden or bright red-chestnut lanceolate-linear scales; stipe and main rhachis glabrous or nearly so; frond 3–4-pinnate, pilose beneath; involucres villous.—*N. hirsutum*, Don, Prodr. Fl. Nep. 6,

not of J. Smith. *N. odoratum*, Hk. & Baker, Syn. Fil. 280. *N. eriocarpum*, Decne; Hook. Sp. Fil. iv. 141. *Aspidium odoratum*, Bory; Willd. Sp. Pl. v. 286. *A. eriocarpum*, Wall. Cat. 342; Mett. Farngatt. Pheg. & Asp. 60; Milde, Fil. Europ. 113. *A. pilosulum*, Wall. Cat. 337, not of Kunze. *A. subdiaphanum*, Wall. Cat. 343. *Lastrea eriocarpa*, Presl; Bedd. Ferns South. Ind. t. 103. *L. crenata*, Bedd. Ferns Brit. Ind. Suppl. p. 18. *Hypedomatium onustum*, Kunze in Flora, 1833, 690. *H. Ruppellianum*, Kunze, Farnkr. Schk. Suppl. t. 21. *Polypodium crenatum*, Forsk. Fl. Egypt-Arab. 185.

Himalaya, alt. 2000–7000 feet, from Gurwhal to Bhotan, common. Khasia, alt. 2000–4500 feet, frequent. Chota Nagpore, alt. 2000–3000 feet.—Distrib. Malay Peninsula, South China, South India, Ceylon, Mauritius, Tropical Africa.

Very partial to limestone: as also Parish notes of the allied *N. Parishii*. *A. pilosulum*, Wall., is much dissected, the segments more remote than usual. *A. subdiaphanum*, Wall., is very thin in texture, less pilose than common; some of the involucre when young are attached laterally on the vein. On the whole *N. crenatum* varies little, and there are no disputed examples.

***** Frond 2–3–4-pinnate, large; involucre often caducous.

22. *N. PULVINULIFERUM*, Hk. & Baker, Syn. Fil. (2nd ed.) 500. Stipe and main rhachis with many chestnut or black subulate persistent scales, often $\frac{1}{4}$ in. long; surface of frond glabrous; secondary pinnæ usually soriferous in their upper portion only.—*N. Buchanani*, Hk. & Baker, Syn. Fil. (2nd ed.) 498. *Aspidium spectabile*, Wall. Cat. 372, partly. *Lastrea pulvinulifera*, Bedd. Ferns Brit. Ind. t. 333, exclud. var. β , Bedd. Suppl. p. 17.

Sikkim, alt. 5000–8000 feet; frequent. Nepaul; Wallich.—Distrib. Bourbon, Natal.

Usually a fine compound fern as described by Bakers, *l. c.*, but not rarely the fronds in fruit are under a foot long, *i. e.* = *N. Buchanani*.

23. *N. SIKKIMENSE*, C. B. Clarke. Stipe and rhachises with ovate acute chestnut or blackish scales; frond 1–3 feet, oblong-lanceolate, glabrous, sub-3-pinnate, texture herbaceous, thin; tertiary pinnæ cuneate-oblong, serrate; involucre thin, persistent, strictly nephroid.—*Polystichum sikkimense*, Bedd. Ferns Brit. Ind. t. 127. *Aspidium sikkimense*, Hk. & Baker, Syn. Fil. 256.

Sikkim, Mon Lepcha, alt. 10,000–12,000 feet; T. Thomson, Sir J. D. Hooker, C. B. Clarke.

One of the most beautiful of ferns. Mr. Baker preferred Beddome's picture of the involucre to the specimens when he referred the species to *Aspidium*. I collected large quantities of this fern (all at the well-known locality); but, never imagining that it could have been supposed a *Polystichum*, have distributed it under the name *Lastrea bella*, nov. sp.

24. *N. SPACIOSA*, C. B. Clarke, not of Hook. Stipe long, with many lanceolate patent persistent scales; main and partial rhachises with scattered narrow lanceolate-linear patent brown-red scales; frond 2-4 feet, ovate, glabrous, sub-4-pinnate; quaternary pinnae oblong, entire, crenate or scarcely serrate; sori small, near the midrib of the tertiary and quaternary pinnae; involucre fugacious.—*Aspidium spectabile*, Wall. Cat. 372. *Lastrea Hendersoni*, Bedd. Ferns Brit. Ind. Suppl. 17, t. 377. *L. Atkinsoni*, Henderson in Kew Herb. formerly.

Nepaul, Wallich. Khasia, alt. 5000-6500 feet, Shillong Hill, Mairung; Griffith, &c.

This is *A. spectabile*, Wall. type sheet; among Wallich's plants issued under this name are *Nephrodium pulvinuliferum* and *Sphaeropteris barbata*. *N. spectabile* is closely allied to *N. pulvinuliferum*; the scales in *N. spectabile* are shorter, broader at the base, and much softer, the rhachis not rough from their harsh bases; the sori are smaller and more generally scattered.

25. *N. RHODOLEPIS*, C. B. Clarke. Stipe long, stout; frond large, ovate, 3-pinnate, 4-pinnatifid; primary, secondary, and tertiary rhachises with ovate, acute, subadpressed hyaline, rose-mauve scales; primary pinnae often 15 in.; tertiary pinnae deeply pinnatifid into oblong entire lobes, glabrous beneath; sori small, near the midrib of the lobes; involucre fugacious.—*Lastrea Blumei*, Bedd. Ferns South. Ind. t. 249, not *Aspidium intermedium*, Blume. (Pl. LXXII.)

Sikkim, Assam, Khasia, alt. 5000-7000 feet. Chittagong, alt. 150 feet, C. B. Clarke (very small form).—Distrib. Ceylon, Japan, Malaya, Polynesia.

Aspidium intermedium, Blume, Enum. Pl. Jav. Fil. 161, is *Nephrodium Blumei*, Hook. Sp. Fil. iv. 135. Blume describes the pinnae as deeply pinnatifid. The specimen of Blume closely fits his own (and Hooker's) description: the scales on the main rhachis are linear; the frond is 1-pinnate, nearly 2-pinnate; the secondary pinnae are large, fibrillose beneath and on the margin. The plant is totally unlike the Indian plant called *Blumei* v. *intermedium* by Thwaites and Maximowicz; and which Sir W. J. Hooker marked "near *L. recedens*." In so great confusion I have proposed a new name. The beautifully hyaline, rose-mauve, ovate, acute, hexagonal-celled scales are abundant and prominent in the North-India and Japan plants; and some are present in the Ceylon examples, though they hardly appear in Beddome's otherwise correct figure.

26. *N. INGENS*, W. S. Atkinson, MS. Stipe and main rhachis pubescent, and with lax narrow-lanceolate sparse brown deciduous scales; frond 6-9 feet, 3-4-pinnate; tertiary rhachises beneath with lax glistening multicellular patent hairs; fertile portions of the frond much contracted; sori large; involucre sometimes aspidioid or nearly so. (Pl. LXXIII.)

Sikkim and Bhotan, alt. 4000-7000 feet, frequent. Khasia; alt. 3000-5000 feet, frequent.

Put in the same bundle at Kew with *N. dissectum* and *N. fuscipes*, but no one has ventured to write either of those names on it. It is the largest Indian *Lastrea* of

N. fascipes, Wall., differs by being much smaller and less divided, by ~~usually~~ always exhibiting some anastomosing veins on the lower pinnæ of the barren fronds (therefore here referred to *Pleocnemia*), by the black permanent scales of the stipe.

N. dissectum, Forst., is much smaller and more glabrous; never shows the multicellular hairs of *N. ingens*; and has the fertile fronds very little contracted: it is a fern of South India, Malaya, and Polynesia, not found in the Temperate Himalaya.

27. *N. SPLENDENS*, Hook. Sp. Fil. iv. 126, excl. β . Stipe and main rhachis bright chestnut, more or less scaly; frond large, long lanceolate; primary pinnæ long, narrow, nearly the same breadth throughout their length, with often 20–30 pairs of short secondary pinnæ.—Hk. & Baker, Syn. Fil. 282. *Lastrea splendens*, Bedd. Ferns Brit. Ind. t. 42.

Sikkim and Bhotan, alt. 6000–7000 feet, frequent.—Distrib. Malay Peninsula.

N. Filix-Mas, var. *marginata*, Wall., has the frond and the primary pinnæ distinctly ovate.

[There is in Wallich's herbarium, among the duplicate sheets of *Polypodium marginale*, Wall. Cat. 318, an example of *Nephrodium scabrosum*, Baker, marked as collected in Nepaul; but in these mixtures of Wallich I doubt the locality as much as the species; I do not think *N. scabrosum* should be marked a Himalayan plant till some other person finds it in the Himalaya. Wallich mixed the plants he got from Wight into his own herbarium by "hand-and-eye" sorting.]

28. *N. ANGUSTIFRONS*, Hk. & Baker, Syn. Fil. 283. Rhizome far-creeping, covered with ovate yellowish scales; stipes distant, with deciduous ovate scales; frond glabrous, elongate, strict, 3-pinnate; tertiary pinnæ very small, oblong or subquadrate, toothed.—*Lastrea angustifrons*, Moore, MS.; Bedd. Ferns Brit. Ind. t. 226.

Nepaul, Wallich. Sikkim, Dr. Treutler.

Not in Wallich's own herbarium, but two sheets of Wallich's collecting detected by Moore in the Kew Herbarium. A very marked species, with the texture, venation, and involucre of *N. Filix-Mas*.

29. *N. BORYANUM*, Hk. & Baker, Syn. Fil. 284 (not of Hook. Sp. Fil. iv. 126). Nearly naked, except a few linear lacerate pales near the base of the stipe; secondary pinnæ cut down to a winged midrib into widely separated pinnatifid segments 1–5 in. long; involucre very fugacious.—*N. divisum*, Hook. Sp. Fil. iv. 133. *Aspidium divisum*, Wall. Cat. 393. *Lastrea Boryana*, Bedd. Ferns South. Ind. t. 97.

Himalaya, from Gurwal to Bhotan, alt. 4000-8000 feet, common. Khasia, alt. 4000-5000 feet, frequent.—Distrib. South India, Ceylon, Malay Peninsula, Bourbon, Java, China.

Very variable in size; usually large, the pinnae 2 feet long, thin in texture, weak from the remoteness of the secondary pinnae. Small fronds (in full fruit) are only 8 in. long, and resemble *N. flaccidum* (i. e. the large variety of *N. gracilescens*) so exactly that I can only distinguish them by the absence of the patent needle-like hairs from the rhachises of the secondary pinnae.

Var. *microstegioides*. Segments of the secondary pinnae oblong, subentire or crenate, standing close together, the sinus between each two very acute.

Over the same Himalayan and Khasi area as *N. Boryanum* type. The extreme form differs a good deal from *N. Boryanum* type; but there are many intermediates.

30. *N. TENERICAULE*, Hook. Sp. Fil. iv. 142, quoad sp. Wallich. Rootstock short; stipe glabrous, smooth, except a few soft linear-subulate pales near the base; main rhachis beneath round, firm, glabrous, smooth, shining, straw-coloured or almost chestnut; primary rhachises beneath glabrous, smooth, or upwards with patent needle-like white hairs, never paleaceous nor scabrid; involucre always present, but early deciduous.—*Polypodium tenericaule*, Wall. Cat. 335. *Lastrea flaccida*, Bedd. Ferns South. Ind. t. 99. *L. setigera*, Bedd. Ferns Brit. Ind. Suppl. p. 18, not *Cheilanthes setigera*, Blume. *Polypodium Russelianum*, Wall. Cat. 7077.

Base of the Himalaya, alt. 0-4000 feet, from Nepaul to Assam and East Bengal, very common, extending some way into the plains as to Sylhet station.—Distrib. South India, Ceylon, Burma, Malaya, China, Australia, Polynesia.

A fern exceedingly constant to the above character. The Kew bundle of *N. setigerum*, Baker, includes Wallich's *Polypodium tenericaule*, Wallich's *P. ornatum*, Roxburgh's *P. punctatum*, Thunb., and *A. uliginosum*, Kunze (probably = *Cheilanthes setigera*, Blume). Of these, *P. ornatum* and *P. punctatum* belong to the genus *Polypodium*, and are, moreover, distinguishable at a glance by their hispid or glandulose main rhachis. The descriptions of Sir W. J. Hooker, Mr. Baker, and Mr. Bentham (in Fl. Austral. vii. 759) are drawn to include these widely-separated plants; and the synonymy of Mettenius, Luerssen, and others is not worth disentangling.

The plant figured by Sir W. J. Hooker (Sp. Fil. iv. t. 269) is *A. uliginosum*, Mett., which is *Polypodium ornatum*, Wall.; whether it is the true *A. uliginosum*, Kunze, may be still open to question. Mr. Baker remarks (in Hk. & Baker, Syn. Fil. 285) that Capt. Beddome considers *Polypodium ornatum*, Wall., distinct from *Neph. setigerum*. I may add that W. S. Atkinson, J. Scott, and Major Henderson agree with Capt. Beddome. One is a *Polypodium*, very large, the fronds attaining even 20 feet in length, the main rhachis muricate-hispid; the other is a *Nephrodium*, moderate-sized or small, the main rhachis glabrous.

[*Nephrodium platypus*, Hook. Sp. Fil. iv. 149, is stated by Baker, in Hk. & Baker, Syn. Fil. 286, to grow in Khasia; but there is no example thence now in the Kew bundle. As to Lobb's Moulmein specimen, figured by Bedd. as *Lastrea platypus*,

Ferns Brit. Ind. t. 228, it has the involucre of *A. aristatum*, and is *A. aristatum*, as Beddome has discovered, Ferns Brit. Ind. Suppl. p. 16.]

Subgenus II. *Eunephrodium*. Lower pair of veinlets (and often some others) uniting into a veinlet carried to the sinus, not otherwise branching. Veinlets all carried to the margin. Sori all across the veinlets, none terminal. Fronds large, pinnate (in the Indian species).

* *Rhizome wide-creeping.*

† *Lower pinnae not tapering to the stipe, nor reduced to auricles.*

31. *N. UNITUM*, R. Br. Prodr. Fl. Nov. Holl. 148. Base of the stipe black, glabrous; pinnae cut down $\frac{1}{3}$ — $\frac{1}{2}$ the way to the midrib; lobes ovate, acute, subentire; lowest pair of veinlets uniting often some distance below the sinus, next pair of veinlets much curving upwards, rarely distinctly uniting with the compound vein.—Hk. & Baker, Syn. Fil. 289. *N. propinquum*, R. Br. l. c.; Hook. Sp. Fil. iv. 79; Bedd. Ferns South. Ind. t. 89. *Aspidium unitum*, Swartz; Wall. Cat. 358 partly; Benth. Fl. Austral. vii. 755. *Polypodium secundum*, Wall. Cat. 301. *P. unitum*, Linn. Sp. Pl. 1548, at least in part.—Burm. Thes. Zeyl. 98, t. 44. fig. 1.

Bengal Plain, abundant in tanks; found in the hills in places permanently wet.—Distrib. South India, Malaya, Tropical Asia, Africa, Australia, America.

I have never seen this fern except floating in a tank or in a permanently wet ditch: the American examples appear also to grow in water. The involucre is nephroid, as also in the Australian specimens.—As to the name, Baker concludes by stating that the *P. unitum* of the Linnean Herbarium is *N. cucullatum*, Baker, which might be inferred to necessitate changing all the names again; but Linnæus quotes Burmann's picture, which represents our *N. unitum*; and R. Brown meant that. As to Schk. Krypt. Gew. tt. 33, b, c, some or all of which are quoted as *N. unitum*, R. Br., they may be so, but no one of those pictures represents the venation typical of the plant in India.

[*N. pteroides*, J. Sm.; Hk. & Baker, Syn. Fil. 289, is said to grow in the Himalaya. The only authority for this at Kew is a single sheet, on which there is a mixture of specimens from Blume and Wallich; with a note that the Wallachian examples were portions of Wall. Cat. 386, from Kumaon. But Wallich states that his *N. terminans*, Wall. Cat. 386, came from the Mts. of Ava. Nobody else finds *N. terminans* in the Himalaya. Mettenius considers it a mere apicifloral variety of *N. extensum*.]

32. *N. EXTENSUM*, Hook. Sp. Fil. iv. 72, t. 240 A. Stipe and main rhachis beneath nearly glabrous; pinnae cut down $\frac{1}{3}$ — $\frac{2}{3}$ the way to the midrib; lowest pair of veinlets alone uniting; lobes subacute, glabrous beneath, except minute glistening hairs on the veinlets; sori medium-sized, mostly in the lobes.—Bedd. Ferns South. Ind. t. 85; Hk. & Baker, Syn. Fil. 289. *Aspidium extensum*, Blume, Enum. Pl. Jav. Fil. 156. *A. conioneuron*, Mett. Farngatt. Pheg. & Asp. 102. *A. prionophyllum*, Wall. Cat. 355, not *A. multijugum*, Wall. Cat. 348.

Khasia, Griffith, 2 sheets.—Distrib. Burma, Malaya, South India, Ceylon.

Var. *microscora*. Stipe with linear-subulate, long, soft, brown, permanent pales towards the base; stipe upwards and main rhachis softly patentely pilose; pinnæ cut down nearly to the midrib, with scattered white needle-like hairs beneath; sori minute, near the midrib of the pinnæ, scarcely extending to the lobes; involucre distinct, glabrous, caducous.

Sikkim, alt. 500–4000 feet, common, *C. B. Clarke*.—This fern is what has been known as the Sikkim form of *N. didymosorum*, Parish. It resembles, indeed, Parish's plant in the cutting and disposition of the sori, but differs in the extensively creeping rhizome and lesser points. Mr. Baker says he does not see where it is to be put except next *N. extensum*, which it resembles in outline, but has the pinnæ still more deeply pinnatifid.

Var. *late-repens*. Creeping 100 yards, throwing up distant fronds; frond sometimes somewhat reduced at base, or the stipe with auricles; sori medium-sized, scattered generally, in hairiness and cutting as the preceding var.

Teraï, universal.—This fern creeps in the sand near streams where they debouch from the hills, covering acres, I might say square miles, of country, as round Siligori.

33. *N. PROCURRENS*, Hk. & Baker, Syn. Fil. 290. Rhizome creeping 1–2 feet; stipe with linear subulate, brown, lax, persistent scales at the base; stipe upwards and main rhachis beneath minutely sparsely hairy; lower pinnæ slightly reduced, or sometimes the frond tapers considerably at the base; pinnæ cut down $\frac{1}{2}$ – $\frac{2}{3}$ the way to the midrib into subobtusate lobes, shortly pubescent on the veins beneath, 1 or 2 pairs of veinlets uniting; sori medium-sized, scattered generally; involucre persistent, minutely hairy.—*Aspidium procurrens*, Mett. in Ann. Mus. Lugd. Bat. i. 231. *A. nymphale*, Blume, Enum. Pl. Jav. Fil. 157, not of Schkuhr.

East Bengal Plain, *C. B. Clarke*.—Distrib. Ceylon, Java.

Mr. Baker remarks, this fern is *uno verbo* *N. parasiticum*, with a creeping rhizome. In no fern is the rhizome really erect; it is decumbent, often very short; but in many ferns, under favourable circumstances, it may be lengthened to 6–12 in. I doubt very much species that stand on this single character; of course there are ferns, like *N. extensum*, var. *late-repens*, where a single rhizome will cover a quarter of an acre; and this is a good character; but I share Mr. Baker's doubts whether *N. procurrens* is other than *N. parasiticum* inclined to creep a little. Whatever it is, we have it in Bengal.

†† *Stipes frequently auricled, or the frond tapering much at the base.*

34. *N. CUCULLATUM*, Hk. & Baker, Syn. Fil. 290. Stipe and main rhachis beneath hairy; pinnæ cut scarcely $\frac{1}{2}$ the way down to the midrib; texture coriaceous, veinlets in the lobes beneath raised when dry, very hairy, several pairs uniting; involucre prominent, persistent, glabrous.—*N. unitum*, Sieber, Wall. Cat. 358, mainly; Hook. Sp. Fil. iv. 81, partly; Mett. Farngatt. Pheg. & Asp. 107; Bedd. Ferns South. Ind. t. 88. *Aspidium cucullatum*, Blume, Enum. Pl. Jav. Fil. 151. *Polypodium caudigerum*, Wall. Cat. 298, type sheet.

Assam, *Griffith*.—Distrib. Ceylon, Malacca, Mauritius, Malaya, Polynesia.

I much doubt this being a North-Indian fern. The authority is the mixed sheet of specimens at Kew, under one of which is noted "*Assam, Griffith*," not in Griffith's writing. Griffith collected good series of this fern at Malacca. In several instances at Kew plants which Griffith collected at Malacca have been pasted down and marked *Assam*, or *Mishmee*, or *Khasia*. I strongly suspect this to be the case here.

[Beddome attributes *N. elatum*, Bojer, a Mauritius fern, to the Himalaya, on the faith of an example of Dr. Jerdon's (see *Ferns Brit. Ind. Suppl.* p. 18). There is in the Kew bundle of *N. elatum*, var. *procerum*, placed one Himalayan specimen of Jerdon's, which is believed to be that which Colonel Beddome depends upon; but it is (now at least) wholly exinvolucrate, and is (for me) one of the commonest Himalayan *Polypodiums*, sect. *Goniopteris*.]

35. *N. ARIDUM*, Hk. & Baker, Syn. Fil. 291. Stipe and main rhachis beneath slightly pubescent; pinnæ cut $\frac{1}{2}$ the way down to the midrib, texture coriaceous; veinlets in the lobes beneath raised when dry, hairy, several pairs uniting; involucres fugacious.—Bedd. *Ferns Brit. Ind.* t. 297. *Aspidium aridum*, Don, Prodr. Fl. Nep. 4. *A. venulosum*, Wall. Cat. 352, type sheet. *Polypodium scabridum*, Wall. Cat. 302.

Throughout Bengal Plain, abundant; from the Soonderbun to Assam and the Dehra Doon, ascending the hills to 3000 feet alt.—Distrib. Throughout India, Ceylon, Malaya, North Australia.

One of the commonest of Indian ferns: the veinlets in the lobes are sometimes forked. The texture and raised veins beneath distinguish this easily from all the *Nephrodiums* except *N. cucullatum*, which is more hairy, has prominent involucres, and (usually) narrower pinnæ. It is requisite with more care to distinguish this fern from *Polypodium*, sect. *Goniopteris*. Colonel Beddome appears now to hold that the species of *Goniopteris* are merely exinvolucrate forms of the corresponding species of *Eunephrodium*; as above, *Athyrium oxyphyllum* has been supposed to include (as a variety) the completely exinvolucrate *Polypodium Kulhaitense*.

** *Caudex erect, or the rhizome decumbent, hardly creeping, stipes approximate.*

36. *N. GLANDULOSUM*, Hook. Sp. Fil. iv. 76, partly. Main rhachis closely villous; frond 1 foot, adpressedly strigose on the upper surface; pinnæ truncate at the base, subentire serrate or pinnatifid scarcely $\frac{1}{2}$ the way to the midrib; veinlets beneath minutely hirsute, several pairs uniting; involucres nephroid, elongate, prominent, firm; sori ultimately often confluent, so that the fern resembles at first sight *Meniscium*.—Bedd. *Ferns Brit. Ind.* t. 132? (Pl. LXXIV. fig. 1.)

Assam, Griffith.—Distrib. Java.

The plant figured by Beddome has different sori, and is not strigose above; it is that taken as the type of *N. glandulosum*, Blume, by Hooker and Mettenius; it is common in Malaya, does not occur in North India. The above diagnosis is from Blume's authentic specimen. Griffith's example is identical with Blume's; but there may be a doubt whether he did not collect it at Malacca, not in Assam. Griffith's

example is pasted down on the same sheet as Blume's, without any original ticket. This marked fern may have been accidentally issued by Blume as his *N. glandulosum*; if so, it might be renamed *N. meniscioides*.

Var. *late-strigosa* (Pl. LXXIV. fig. 2). Fronds 2-4 feet; pinnæ pinnatifid $\frac{3}{4}$ the way to the midrib; involucre firm, nephrodioid, glabrous, sori not confluent.

Sylhet, Griffith. Chittagong Hills, alt. 0-500 feet, abundant, C. B. Clarke.—This differs from *N. pennigerum*, Hk., by the frond being strigose above, abrupt at the base.

37. *N. PENNIGERUM*, Hook. Sp. Fil. iv. 72. Stipe villous; frond large; lowest pinnæ reduced distant sometimes to auricles; pinnæ cut $\frac{1}{4}$ - $\frac{1}{3}$ the way down to the midrib; lobes ovate, subacute, hardly toothed, 2-8 pairs of veinlets uniting; rhachis and under surface villous; involucre subpersistent.—Hk. & Baker, Syn. Fil. 292. *N. abruptum*, Bedd. Ferns South. Ind. t. 86. *Aspidium pennigerum*, Blume, Enum. Pl. Jav. Fil. 153, not of Swartz. *A. megaphyllum*, Mett. in Ann. Mus. Lugd. Bat. i. 233.

Ceylon, Malay Peninsula and Islands, Tropical Africa.

Var. *multilineata*, Wall. Cat. 353. Main rhachis and veinlets beneath puberulous, minutely pubescent or glabrous; frond otherwise glabrous.

East Bengal from Mishmee (Griffith) to Chittagong, where it is plentiful, alt. 200-1000 feet.—Distrib. Malay Peninsula.

38. *N. AMBOINENSE*, Presl; Hook. Sp. Fil. iv. 75. Stipe and main rhachis beneath nearly naked; frond somewhat reduced at the base, but scarcely tapering; pinnæ subentire or cut $\frac{1}{3}$ the way down to the midrib into close oblong subfalcate lobes, several pair of veinlets uniting, minutely hairy beneath or glabrous; involucre glabrous, deciduous.—Hk. & Baker, Syn. Fil. 292. *N. extensum*, var. β . *minor*, Bedd. Ferns Brit. Ind. t. 201. *N. latipinna*, Hk. & Baker, Syn. Fil. 292. *Aspidium amboinense*, Willd.; Blume, Enum. Pl. Jav. Fil. 148; Mett. Farngett. Pheg. & Asp. 105.

Bengal and Assam, near the foot of the hills, common.—Distrib. South India, Ceylon, Burma, Malaya, Tropical Asia, Africa, and America.

This fern is that portion of *N. parasiticum* that has the pinnæ cut down less than $\frac{1}{3}$ the way to the midrib. The separation of the two species is artificial. I altogether doubt their distinctness. It is impossible to state the area of *N. amboinense* with any accuracy, as a considerable number of the specimens are quite uncertainly referred to it, and may be *N. parasiticum*.—As to *N. latipinna*, if separable as the most trifling var. of *N. amboinense*, it grows in Chittagong. My examples and the Hongkong typical are identical.—*N. Arbuscula*, Desv., is said by Col. Beddome to be "general" in India. There are no examples of typical *N. Arbuscula* from North India; there are placed in the Kew *N. Arbuscula* bundle specimens which I can exactly match out of my Chittagong collections, therein named *N. amboinense*.

39. *N. PARASITICUM*, C. B. Clarke. Rhizome tufted or very shortly creeping; stipe and main rhachis beneath pubescent, shortly hairy or glabrous, not with long hairs, with few or no scales; frond oblong-lanceolate, lowest pinnæ usually narrower and remote, often more or less pilose on both surfaces, or glabrous beneath, except on the nerves; pinnæ cut down $\frac{1}{2}$ — $\frac{3}{4}$ the way to the midrib into oblong subobtusely nearly entire lobes, lowest pair of veins (rarely 1 superior pair) uniting; involucres hairy or glabrous, deciduous.—*N. molle*, Desv.; Hook. Sp. Fil. iv. 67; Bedd. Ferns South. Ind. t. 84; Hk. & Baker, Syn. Fil. 293. *N. nymphale*, Carr. in Fl. Viti. 363. *Aspidium parasiticum*, Swartz; Wall. Cat. 7082; Blume, Enum. Pl. Jav. Fil. 158. *A. molle*, Swartz; Milde, Fil. Europ. 111; Benth. Fl. Austral. vii. 756. *A. canescens*, Wall. Cat. 354. *A. tectum*, Wall. Cat. 394. *A. canum*, Wall. Cat. 387, partly. *A. solutum*, Wall. Cat. 350. *Polypodium parasiticum*, Linn. Sp. Pl. 1551. *P. molle*, Jacq. Ic. Pl. Rar. t. 640. *P. molliusculum*, Wall. Cat. 332. *P. nemorale*, Wall. Cat. 317.

Throughout India, abundant; ascending the mountains to 5000 feet alt.—Distrib. In tropical and warm temperate regions, almost throughout the globe: one of the most universal and plentiful of ferns.

Very little variable considering the extensive range. The var. *didymosorum*, Parish; Bedd. Ferns Brit. Ind. t. 200, has the rhachis long, patently hairy, and the sori nearly confined to the centre of the pinnæ. The authentic example I have of this does not show the rhizome; but our didymosorous Sikkim *Nephrodium* is a var. of *N. extensum* above, which see.

Var. *multijuga*. Pinnæ very close together, the lowest deflexed, not remote, nor much shorter than those above.—*Aspidium multijugum*, Wall. Cat. 348, not *Nephrodium multijugum*, Baker.

Penang, Wallich. Sikkim, in a subtropical valley, W. S. Atkinson.—Fronds large and broad.

Var. *aurea*. Stipes closely tufted, grey-pubescent, fertile much longer than the barren; frond truncate at the base, lowest pair of pinnæ nearly as long as any above them; pinnæ often contracted near the base, cut down $\frac{3}{4}$ of the way to the midrib; under surface and involucres with minute bright aureous hairs.

Sikkim and Bhotan; alt. 1000–4000 feet, frequent, C. B. Clarke. Assam, Griffith. —I have always regarded this fern as specifically separable from *N. parasiticum*, which does not show the bright aureous hairs glistening on the under surface. But Major Henderson thinks it undesirable to increase the number of species of *Nephrodium* very close to *N. parasiticum*.

40. *N. CRINIPES*, Hook. Sp. Fil. iv. 71. Large; stipe and main rhachis with many lanceolate-linear thin brown scales; pinnæ cut down $\frac{1}{2}$ — $\frac{3}{4}$ the way to the midrib into broad-oblong hardly acute lobes; veinlets and rhachises beneath minutely puberulo-pubescent, otherwise glabrous.—Bedd. Ferns Brit. Ind. t. 263; Hk. & Baker, Syn. Fil. 294.

North and East Bengal, near the foot of the hills, alt. 0-1500 feet, from Nepal to Assam and Chittagong, frequent.—Distrib. Malacca.

Col. Beddome sends to Kew a piece from the middle of a Nilgherry frond which seems *N. crinipes*. Beddome's figure, t. 263, shows the main rhachis hairy: the distinguishing mark of the species is that the scales are from a lanceolate base.

[*N. ferox*, Moore, Hk. & Baker, Syn. Fil. 294, is said to have been found in Kumaon. It has the stem with harsh scales, the sori in two rows next the midrib of the pinnae, and coriaceous texture. There is at Kew one mixed sheet of specimens, one piece of which is *N. ferox*. The sheet is marked "Kumaon, Wallich v. Wight." I should require very much additional evidence before believing that a low-level Malay fern, *N. ferox*, is to be found in Kumaon. It is not a plant to be easily overlooked; but no one now can find it in Kumaon.]

41. *N. TRUNCATUM*, Presl, Tent. Pterid. 81. Tufted; stipe and main rhachis puberulous or slightly pubescent; lowest pinnae smaller, remote, often reduced to auricles; pinnae cut $\frac{1}{3}$ — $\frac{1}{2}$ down into oblong truncate lobes, glabrous or nearly so, 1-2 pairs of veins uniting; involucres small, fugacious.—Carr. in Fl. Viti. 363; Hk. & Baker, Syn. Fil. 294. *N. abruptum*, Presl; Hook. Sp. Fil. iv. 77, t. 241 B. *N. Hudsonianum*, Brack. U.S. Explor. Ferns, t. 25. *N. eusorum*, Bedd. Ferns South. Ind. t. 130. *Aspidium truncatum*, Gaud.; Luerssen, Fil. Graeff. 192; Benth. Fl. Austral. vii. 756. *A. abruptum*, Blume, Enum. Pl. Jav. Fil. 154. *A. multilineatum*, Wall. Cat. 353. *A. prionophyllum*, Wall. Cat. 355, chiefly and as to type sheet. *A. eusorum*, Thwaites, Enum. Pl. Ceyl. 391. *Polystichum truncatum*, Gaud. in Freycinet, Voy. Bot. 333, t. 10.

Cachar, R. L. Keenan. Chittagong Hills, alt. 250 feet; C. B. Clarke.—Distrib. South India, Ceylon, Malay Peninsula and Islands, North Australia, Polynesia.

Very near the large glabrescent form of *N. parasiticum*. It can generally be recognized by the truncate toothed apex of the lobes and its thin texture, but is very doubtfully separable (see Benth. l. c.). *A. venulosum*, Wall. Cat. 352, placed in the *N. truncatum* Kew bundle, is (for me) *N. parasiticum*.

Subgenus III. *Pleocnemia*. Frond 1-2-3-pinnate. Lowest pair of veinlets in the ultimate pinna, at least in the lower part of the barren frond, uniting; veinlets in the ultimate lobes often forked or pinnate; no free veinlets included within the looped veins.

42. *N. MEMBRANIFOLIUM*, Presl, Rel. Hænck. 36, t. 5. fig. 3. Stipes tufted, with black linear-subulate scales near the base; free pinnae 1-8 pairs, the lower sometimes completely pinnate; main rhachis and both surfaces of the fronds more or less softly hairy with multicellular hairs; veins in the barren portions of the frond looped (at least a few of them); fronds uniform, subdimorphic or strongly dimorphic.—Hook. Sp. Fil. iv. 131, t. 261; Hk. & Baker, Syn. Fil. 282, partly, not *N. dissectum*, Hk. & Baker, Syn. Fil. (2nd ed.), 282. *Aspidium fuscipes*, Wall. Cat.

361, partly, not as to type sheet; Bedd. Ferns Brit. Ind. Suppl. 15, t. 366. *A. membranifolium*, Mett. Farngatt. Pheg. & Asp. 118.

Plain of Eastern Bengal, extending into Assam, Cachar, Chittagong; ascending the hills in Khasia and Sikkim to 3000 feet alt., abundant.—Distrib. Burma, Malay Peninsula.

A very common fern, with the habit of *Sagenia cicutaria*; easily recognized by the persistent black scales on the lower half of the stipe. The sori are aspidioid rather than nephrodioid, as Col. Beddome shows. But in rearranging the species of *Aspidium* with *Nephrodium* (as those genera are understood by Mr. Baker), I should rely rather on the venation than on the involucre. The type sheet of *Aspidium fuscipes*, Wall. Cat. 361, is *Nephrodium sagenioides*, Baker. Our species has been supposed to be a great stumbling-block to those systematists who depend on venation as the character for a primary division of the genus; but when separated (as it certainly should be) from *N. ingens*, *dissectum*, and *sagenioides*, I do not see that it should be. In its non-dimorphic form (figured by Hooker and Beddome) the fronds have some inarching veins: in its dimorphic forms the barren frond always shows some inarching veins. This fern varies greatly in cutting. The following are two among many striking forms of it:—

Var. *typica*. Fertile and barren fronds similar, lanceolate, 3–6 in. long, scarcely 1-pinnate, or with 1 pair of free pinnæ; texture (when alive) white, glistening, membranous, often very hairy. (Pl. LXXV. fig. A.)

Tipperah and Chittagong, in densely jungled valleys, common.

Var. *dimorpha*. Fertile and barren fronds very unlike, 18 by 12 in. or often more, 2-pinnate, 3-pinnatifid; barren frond full green, with many inarching veins; fertile frond more membranous, veins all free. (Pl. LXXV. figs. B, C.)

Throughout East Bengal.—Varieties between this and Col. Beddome's type are common. My very dimorphic examples have been more than once marked by Col. Beddome as "*Sagenia*, nov. sp.;" but I believe he now regards them as only a form of *N. fuscipes*.—Throughout *Sagenia* and *Pleocnemia* the fertile portions of the frond are often more or less contracted, and when much contracted show few (or no) inarching veins.

43. *N. LEUZEANUM*, Hook. Sp. Fil. iv. 61. Stipe rusty pubescent or shortly hirsute, without scales; frond 1–4 feet, 2-pinnate, 3-pinnatifid; ultimate segments ovate, rounded, entire or denticulate, usually with a tooth in the sinus at their base; sori mixed with yellow glandular hairs; involucre fugacious.—Hk. & Baker, Syn. Fil. 295. *Aspidium Luzeanum*, Kunze; Mett. Farngatt. Pheg. & Asp. 116, Fil. Hort. Lips. t. 22. figs. 8, 9. *A. conjugatum*, Blume, Enum. Pl. Jav. Fil. 169. *Pleocnemia Leuzeana*, Presl; Hk. & Bauer, Gen. Fil. t. 97; Carr. in Fl. Viti. 361; Bedd. Ferns Brit. Ind. t. 134. *P. javanica*, Presl, Epimel. Bot. 50. *Polypodium Leuzeanum*, Gaud. in Freycinet, Voy. Bot. t. 6. *P. pubigerum*, Wall. Cat. 7078.

Base of the hills in North and East Bengal, alt. 0–2000 feet; Sikkim, Assam, Cachar,

Khasia, Chittagong; nowhere very common.—Distrib. Burma, Malaya, China, Polynesia, North Australia.

Veinlets beneath (and sometimes the surface) with minute golden hairs; but these seem often wanting in the Polynesian and Malay examples. *Polypodium (Dictyopteris) macrodon*, Reinw.; Hk. & Baker, Syn. Fil. 318, closely resembles *N. Leuzeanum*; the sori are smaller, more scattered, without golden hairs.

44. *N. ARTINEXUM*, C. B. Clarke. Frond 28 by 12 in., narrowed at the base to distant auricles, softly shortly villous, 1-pinnate; pinnæ cut down to a narrow wing into narrow segments 1–1½ in. long, often pinnatifid upwards; involucres villous; sori near the midrib of the pinnæ or the margin of the segments.—*Pleocnemia Clarkei*, Bedd. Ferns Brit. Ind. Suppl. p. 15, t. 368, not *Nephrodium Clarkei*, Baker.

Sikkim, alt. 4500 feet, once collected; on the path descending south from Dikeeling, *C. B. Clarke*.

Subgenus IV. *Sagenia*. Frond 1–2-pinnate. Veinlets inarching freely, at least in the barren parts of the frond, with free veinlets often included within the arches; veinlets in the ultimate lobes often forked or pinnate.

* *Sori in more than two rows between the principal nerves, often irregularly scattered.*

45. *N. VASTUM*, Hk. & Baker, Syn. Fil. 296. Stipes scattered, with numerous linear-subulate brown persistent scales, winged at least upwards; frond 2–4 feet, sub-1-pinnate; pinnæ 6–8 by 2 in., subentire, caudate, lowest pair often furcate; anastomosing veins very numerous, with many included terminating veinlets.—*Aspidium vastum*, Blume, Enum. Pl. Jav. Fil. 142; Mett. Fil. Hort. Lips. t. 22. fig. 7. *A. alatum*, Wall. Cat. 378; Hk. & Grev. Ic. Fil. t. 184; Mett. Farngatt. Pheg. & Asp. 123, t. 18. fig. 1; Hook. Sp. Fil. iv. 47. *Sagenia alata*, Bedd. Ferns Brit. Ind. t. 169.

East Bengal, alt. 0–1000 feet; Mishmee, Khasia, Chittagong.—Distrib. Burma, Malaya.

Involucres mostly nephrodioid. *Polypodium dilatatum*, Wall., much confounded with this, has (*inter alia*) the stipe without scales.

46. *N. SUBCONFLUENS*, C. B. Clarke. Stipes tufted, 1–2 feet long, with linear-subulate dark brown persistent scales; frond 6–12 in., triangular in outline, tripartite, terminal pinna deeply pinnatifid; lobes 3–6 in., pinnatifid ¼ the way down to the midrib; lateral pinnæ ovate, auriculate, sub-2-pinnatifid, more developed on the lower side; surface glabrous above, rusty puberulo-pubescent on the veins beneath.—*Aspidium subconfluens*, Bedd. Ferns Brit. Ind. Suppl. p. 14, t. 364.

Khasia, alt. 3000–3500 feet; below Umwai, *C. B. Clarke*.

Said by Col. Beddome (*l. c.*) to have been obtained by Major Henderson in the Himalaya; but Major Henderson tells me that he never collected the plant, and I doubt its being Himalayan. The sori are very variable in position: sometimes they are nearly in two regular rows on either side the main nerves; sometimes they are in a

row very close round the margin of the frond; sometimes they are terminal on included veinlets.

47. *N. HETEROSORUM*, Hk. & Baker, Syn. Fil. 2nd ed. 504. Rhizome creeping extensively; stipes solitary, erect, with lanceolate-linear brown persistent scales near their base; frond erect, lanceolate, hardly narrowed at the base, 1-pinnate; pinnæ 4–8 in., narrow-oblong, acuminate-caudate, subsessile, very entire, the lowest never furcate, often with auricles at their base.—*Aspidium rostratum*, Wall. Cat. 383 partly. *A. grandifolium*, Mett. Farngatt. Pheg. & Asp. 124, exemp. authent. *Sagenia heterocarpa*, Bedd. Ferns Brit. Ind. t. 47.

In wet flats near rivers in Assam and Chittagong.—Distrib. Burma.

A very distinct fern, forming large groves about 6 feet high, the separate fronds so erect that till I had the plant in my hand I never suspected it to be a fern. Herbarium scraps of it are much jumbled with *N. polymorphum*, which, however, has the lower pinnæ more stalked, often furcate, the pinnæ less entire, less rostrate, and is without the club-shaped auricles at the base of the pinnæ so very frequently seen in *A. heterosorum*. The sori are sometimes confluent both in *N. heterosorum* and in *N. polymorphum*.—Mettenius's description (*l. c.*) copied by Hook. Sp. Fil. iv. 58, is referred to *N. polymorphum* by Baker in Hk. & Baker, Syn. Fil. 298; and probably correctly, *i. e.* it seems that Mettenius described from an example of *N. polymorphum*, but the example he named for Kew with his own hand *N. grandifolium* is *N. heterosorum*.

48. *N. POLYMORPHUM*, Hk. & Baker, Syn. Fil. 297. Stipes tufted, paleaceous towards the base; main rhachis yellow or brown; frond 1–3 feet, lanceolate, broadest at the base, 1-pinnate; pinnæ oblong or elliptic, acuminate, crenate lobed or toothed; lowest pair distinctly stalked, often furcate, sometimes again pinnate.—*Aspidium polymorphum*, Wall. Cat. 382; Hook. Sp. Fil. iv. 54, excl. syn.; Bedd. Ferns South. Ind. tt. 116, 117. *A. rostratum*, Wall. Cat. 383 chiefly and as to type sheet.

In and near the hills, alt. 0–5000 feet, from Gurwhal to Mishmee and Chittagong, abundant.—Distrib. Burma, South India, Ceylon.

In some of my specimens in young fruit the involucre are exactly aspidioid. Beddome doubts, Ferns Brit. Ind. Suppl. 14, whether *A. repandum*, Willd.; Hk. & Baker, Syn. Fil. 258, be even a good var. of *N. polymorphum*: the two are doubtless congeneric and closely allied. Willdenow probably really meant our common *N. polymorphum* by his term *A. repandum*, which is the older name; but the fern preserved at Kew as *A. repandum* is one collected by Cuming in the Philippines, and differs somewhat from our *N. polymorphum*; in short, greatly resembles Bedd. Ferns South. Ind. t. 117.

- Var. *Simonsii*, (sp.) Hk. & Baker, Syn. Fil. 504. Main rhachis shining black or mainly so, otherwise exactly as *N. polymorphum*.—*Aspidium Simonsii*, Bedd. Ferns Brit. Ind. Suppl. p. 15, t. 367.

Sikkim and Bhotan.—I cannot see that this is separable from many forms of *N. polymorphum*, as from var. *macrocarpum*, Bedd.

**** Sori in two rows between the principal nerves.**

49. *N. VARIOLOSUM*, Hk. & Baker, Syn. Fil. 298. Stipes tufted, pubescent, only near the base paleaceous; fronds more or less dimorphous; the fertile frond on a longer stipe, more divided, with narrower segments, somewhat more membranous, less hairy; lowest pair of pinnæ furcate, sometimes pinnate; sori medium-sized or rather large, usually terminal on veinlets included within looped veins; involucres aspidioid.—*Aspidium variolosum*, Wall. Cat. 379; Hook. Sp. Fil. iv. 51; Bedd. Ferns Brit. Ind. t. 365, not t. 170. *A. Zollingerianum*, Herb. Kew.; Bedd. Ferns Brit. Ind. t. 251, ? of Kunze.

East Bengal Plain, abundant; extending from Assam to Chittagong.—Distrib. Burma, Malay Peninsula.

Helfer's Tenasserim example, No. 362, has been marked for Kew by Mettenius's hand *Aspidium Zollingerianum*, Kunze: it is identical with Wallich's type *A. variolosum*, No. 379, which represents the distinctly dimorphic state of the plant. It is possible that the Java *A. Zollingerianum*, Kunze, is something different, and that Mettenius has made a mistake. However that may be, I am strongly of opinion that all the East Bengal and Pegu specimens are but one species, varying a good deal (as does *N. fuscipes*) in the degree of difference between the fertile and barren fronds.—Baker describes the rhizome as creeping; so it is, and so is the rhizome in all ferns. In *N. variolosum* there are usually 4–6 stipes within an inch of length of the rhizome: the rhizome may creep 3–6 in., but in the same year only throws up stipes at one point just behind the growing end. The real distinction between creeping and tufted ferns is between this state and that in *N. rostratum* (No. 45), where the fronds over many square yards all spring from one rhizome, the stipes are distant; the rhizome creeps deeply, the growing point not being above the surface of the ground.

50. *N. WIGHTII*, C. B. Clarke. Stipe and main rhachis glabrous or nearly so; fronds 1-pinnate, large, distinctly dimorphous; fertile pinnæ rarely half as wide as the barren; lowest pinnæ lanceolate, entire, narrowed at the base.—*N. siifolium*, Hk. & Baker, Syn. Fil. 299 partly. (Pl. LXXVI.)

Bhotan, Griffith.—Distrib. Mts. of South India.

Considered as a var. of *A. polymorphum* by Bedd. Ferns Brit. Ind. Suppl. p. 14. The sori are strictly and invariably biserial between the main nerves, as insisted on by Mr. Baker, and this involves a complex but radical difference in the venation. *N. polymorphum* is never distinctly dimorphic as *N. Wightii* always is; also *N. polymorphum* has the lowest pinnæ usually forked, or at least rounded subauriculate at the base, often crenate or lobed; in short, I think with Mr. Baker that *N. Wightii* and *N. polymorphum* differ as much as any two of the section *Sagenia*.—*Aspidium siifolium*, Mett. in Ann. Mus. Lugd. Bat. i. 237, is *A. Teijsmannianum*, Hook. Sp. Fil. iv. 41, t. 236, and is no doubt the original *Polypodium siifolium*, Willd. Sp. Pl. v. 196. Mettenius has marked very poor fragments from the upper portions of *N. Wightii* (collected by Wight near Courtallum)

51. *N. DECURRENS*, Hk. & Baker, Syn. Fil. 299. Rhizome creeping; stipe with many linear-subulate brown persistent scales below; frond 1-pinnate; main rhachis winged, the wing often decurrent down the stipe; fertile frond often 3 feet; lowest pinnæ 8 in., furcate; barren frond smaller, sometimes undivided palmately 3-lobed.—*Aspidium decurrens*, Presl, Rel. Haenck. 28. *A. pteropus*, Kunze; Hook. Sp. Fil. iv. 47; Mett. Farngatt. Pheg. & Asp. 120. *A. macrophyllum*, Blume, Enum. Pl. Jav. Fil. 144, not of Swartz. *Cardiochlæna alata*, Fée, Gen. Fil. 315. *Sagenia pteropus*, Kunze; Carr. in Fl. Viti. 363; Bedd. Ferns South. Ind. t. 82.

Eastern Bengal, at the foot of the hills; Assam, Cachar, Chittagong, frequent.—Distrib. Ceylon, Malay Peninsula and Islands, South China, Polynesia.

Mettenius says that his *A. pteropus* is not *decurrens*, Presl; but as he quotes Cuming, no. 148, it is certain that it is, as Mr. Baker states. The margin of the barren fronds is usually quite entire, of the fertile undulate-crenate, which may have puzzled Mettenius, who had very scant material. There are placed in the Kew *N. decurrens* bundle now some specimens from Brazil, which are very near, but do not, I think, belong, as the sori are not at all regularly biserial.

52. *N. CICUTARIUM*, Hk. & Baker, Syn. Fil. 299. Stipes tufted, with many scales close to the bases; main rhachis and primary partial rhachises beneath glabrous or nearly so; frond very thin in texture, nearly glabrous on the surface beneath, 1-2-pinnate, sometimes 3-pinnate, deltoid in outline; sori both terminal on a vein terminating within looped veins and across the veins; involucre obscurely nephroid, sometimes altogether aspidioid.—*N. giganteum*, Hk. & Baker, Syn. Fil. 299, largely. *Aspidium cicutarium*, Swartz; Mett. Farngatt. Pheg. & Asp. 117; Hook. Sp. Fil. iv. 48. *B. apiifolium*, Schk. Krypt. Gew. t. 56 B. *Polypodium cicutarium*, Linn. Sp. Pl. 1549. *P. Hippocrepis*, Jacq. Ic. Pl. Rar. t. 641. *Sagenia Hippocrepis*, Hk. & Bauer, Gen. Fil. t. 53 A. *S. macrodonta*, Fée, Gen. Fil. t. 24 A. fig. 1. *S. gigantea*, Bedd. Ferns South. Ind. t. 80.

In the hills, alt. 0-5000 feet, from Gurwhal to Bhotan and Chittagong, common.

Chota Nagpore, alt. 1000-4000 feet, common.—Distrib. South India, Ceylon, Burma, Malaya. In the tropics of nearly the whole globe.

Var. *coadunata*, Wall. Cat. 877, partly. Frond thick, hairy on the rhachises, and often on the frond beneath; involucre nephroid.—Hk. & Gray. Ic. Fil. t. 202. *Sagenia coadunata*, Bedd. Ferns South. Ind. t. 81. *S. variegata*, Bedd. Ferns Brit. Ind. t. 170.

As widely spread in North India as the typical *N. cicutarium*, and still more plentiful. So far as the North-Indian examples are concerned, *N. coadunatum* may be held a distinct species; but in the large collections from all parts of the globe I cannot sort as between *N. cicutarium* and *N. coadunatum*. In North India *N. cicutarium* is, when fairly developed, 2-3 feet across, very thin, light green and glabrous, 2-pinnate, often 3-pinnate, the pinnæ often remote; while *N. coadunatum* is a stout firm thick hairy frond on a short stipe, often 1-pinnate, or if 2-pinnate with approximate pinnæ. Wallich's type sheet of *Aspidium coadunatum* is very glabrous, and is unfortunately exactly that variety which has been known in India as *not* var. *coadunata*.

53. *N. MULTICAUDATUM*, C. B. Clarke. Stipe 1-3 feet, densely clothed nearly its whole length with linear-subulate brown persistent scales; frond very large, 2-pinnate, 3-pinnatifid; primary lower pinnæ usually 1 foot long; rhachises beneath rusty-puberulous, slightly paleaceous.—*Aspidium multicaudatum*, Wall. in Hrb. *Sagenia silhetensis*, C. B. Clarke in Herb. (Pl. LXXVII.)

Southern base of the Khasi Hills, alt. 0-1000 feet, from Shooshung to Cachar, C. B. Clarke.—Distrib. Chappedong.

Much the finest of Indian *Sagenias*, and easily known by the long densely paleaceous stipe: I can see little difference in the venation and sori between this and *N. cicutarium*, var. *coadunata*.

30. NEPHROLEPIS, Schott.

1. *N. CORDIFOLIA*, Hk. & Baker, Syn. Fil. 300. Rhizome abbreviated, roots often bearing tubers; pinnæ numerous, crowded, obtuse or not very acute; sori midway between the midrib and margin, or sometimes nearer the margin; involucre horse-shoe-shaped.—Luerssen, Fil. Graeff. 198. *N. tuberosa*, Presl; Hook. Sp. Fil. iv. 151; Carr. in Fl. Viti. 361; Milde, Fil. Europ. 170; Bedd. Ferns South. Ind. t. 92. *Aspidium Tavoyanum*, Wall. Cat. 1032. *A. auriculatum*, Wall. Cat. 2233, chiefly. *A. imbricatum*, Blume, Enum. Pl. Jav. Fil. 146, ? of Kaulf. *A. obtusifolium*, Blume, Enum. Pl. Jav. Fil. 145, ? of Willd. *A. cordifolium*, Benth. Fl. Austral. vii. 754. *Nephrodium delicatulum*, Dcne, in Jacquem. Voy. Bot. 178, t. 179. *Polypodium cordifolium*, Linn. Sp. Pl. 1549.

North India, general; alt. 0-5000 feet, from Chumba to Bhotan and Chittagong: as well as on the hills bordering Hindosthan on the south.—Distrib. South India, Ceylon, Burma, Malaya; the tropics of the whole world, extending to New Zealand, Japan.

The pinnæ are generally shorter than in the next species; but *N. cordifolia* is sometimes 4-5 feet long, without tubers and with subacute pinnæ, and then runs very close

to *N. cordifolia*. I can find no tangible difference in the base of the pinnae which Mr. Beckett gives as the leading distinction. The favourite locality for *N. cordifolia* is a wet rock, when it usually produces tubers, and is easily recognised.

2. *N. exaltata*, Schott; Hook. Sp. Fil. iv. 152. Rhizome abbreviated; pinnae narrowly-oblong acuminate, truncate and auricled at the base, often acutely serrate towards the apex; sori marginal.—Bedd. Ferns South. Ind. t. 98; Hk. & Baker, Syn. Fil. 301. *Aspidium exaltatum*, Wall. Cat. 1031, partly; Schk. Krypt. Gew. t. 82 b; Blume, Enum. Pl. Jav. Fil. 146; Benth. Fl. Austral. vii. 754. *A. hirsutum*, Schk. Krypt. Gew. t. 83; Blume, Enum. Pl. Jav. Fil. 146. *A. Schkuhrrii*, Blume, Enum. Pl. Jav. Fil. 147. *A. sublanosum*, Wall. Cat. 365. *A. pilosum*, Langsd. & Fisch. Voy. Russ. 14, t. 16. *Polypodium exaltatum*, Linn. Sp. Pl. 1548.

East Bengal, from Assam to Chittagong; alt. 0-1000 feet, frequent.—Distrib. South India, Ceylon, Burma, Malaya; and the tropics nearly of the whole world.

Usually larger than *N. cordifolia*, the pinnae commonly 2-4 in. long. Main rachis, and sometimes the frond beneath, hairy; texture usually firm; venation not prominent. Involucres less hippocrepiform than in *N. cordifolia*.

3. *N. volubilis*, J. Smith, in Herb. Hook. f. & Thoms. Rhizome climbing 25-50 feet high over trees, with adpressed chestnut scales on the short lateral distant spurs, whence spring clusters of stipes; pinnae obtuse or not very acute; venation and sori much as in *N. exaltata*.—*Aspidium exaltatum*, Wall. Cat. 1031 partly, marked *viz exaltatum* by Wallich. *Lindsaya lanuginosa*, Wall. Cat. 154. (Pl. LXXVIII.)

Sylhet Station and Chittagong; Hook. f. & T. Thoms.; C. B. Clarke.—Distrib. Malacca, Borneo.

Considered a variety of *N. exaltata* in Hk. & Baker, Syn. Fil. 301; but with the arrival of more material Mr. Baker inclines to admit it as a good species. The two grow together plentifully in Sylhet Station, but are there easily distinguished.

4. *N. acuta*, Presl; Hook. Sp. Fil. iv. 153. Rhizome abbreviated; frond large, often 8 feet long, thin, green, the venation prominent; pinnae often 4-6 by $\frac{3}{4}$ in.; sori $\frac{1}{8}$ in. from the margin.—Carr. in Fl. Viti. 361; Bedd. Ferns South. Ind. t. 94; Hk. & Baker, Syn. Fil. 301. *Aspidium acutum*, Swartz; Schk. Krypt. Gew. t. 31. *A. splendens*, Willd.; Blume, Enum. Pl. Jav. Fil. 147.

Chittagong Hills; alt. 0-1000 feet, C. B. Clarke.—Distrib. Ceylon?, Malaya, Polynesia, Tropical Africa.

Hardly distinguishable from *N. exaltata* but by its larger size and thin texture; the area is consequently very doubtful.

31. OLEANDRA, Cav.

1. *O. NERIIFORMIS*, Cav.; Hook. Fil. Exot. t. 58. Scales adpressed towards the extremities of the rhizome; stipes whorled, 0-1 in.; frond glabrous or nearly so; sori

in a single row on each side and close to the midrib.—Hook. Sp. Fil. iv. 156; Bedd. Ferns South. Ind. t. 91, Ferns Brit. Ind. t. 264; Hk. & Baker, Syn. Fil. 302; Luerssen, Fil. Graeff. 196. *O. musæfolia*, Kunze; Hk. & Baker, Syn. Fil. 302. *Aspidium neriforme*, Swartz; Blume, Enum. Pl. Jav. Fil. 140; Kunze, Farnkr. Suppl. to Schk. t. 18. *A. Wallichianum*, Wall. Cat. 373, partly; Bélanger & Bory, Fl. Ind. Or. Krypt. t. 5. *A. musæfolium*, Blume, Enum. Pl. Jav. Fil. 141, with many others; see Mett. in Ann. Mus. Lugd. Bat. i. 240, 241.

Himalaya, from Nepaul eastwards; and Khasia; alt. 2000–5000 feet, common.—Distrib. South India, Ceylon, Malaya, Polynesia, Central America.

A scandent fern; when well developed with pendent main stem, the lateral stipe-bearing spurs grow upwards. The type of *O. neriformis* and *O. musæfolia* may be found growing on one stem: the upcurved spurs often carry large fronds.

2. *O. WALLICHII*, Presl, Tent. Pterid. 78. Scales of the rhizome linear, spreading, except very near the extremities; stipes scattered, 0–3 in., sometimes with ovate deciduous scales; frond soft, more or less hairy, the rhachis beneath hairy or scaly, rarely glabrous, base rounded or tapering; sori in a single row on each side and near the midrib.—Hook. Sp. Fil. iv. 158; Bedd. Ferns Brit. Ind. t. 265; Hk. & Baker, Syn. Fil. 303. *Aspidium Wallichii*, Hook. Exot. Fl. t. 5. *A. Wallichianum*, Wall. Cat. 373, partly. *Neuronia asplenoides*, Don, Prodr. Fl. Nep. 6.

From Gurwhal to Bhotan and Khasia; alt. 2000–7000 feet, common.

3. *O. CUMINGII*, J. Smith; Hook. Sp. Fil. iv. 158. Scales of the rhizome lanceolate subulate, closely adpressed; stipes scattered, 2–6 in.—Bedd. Ferns Brit. Ind. t. 135; Hk. & Baker, Syn. Fil. 303.

Assam, Griffith.—Distrib. South India, Ceylon, Malaya, Hongkong, Philippines.

Griffith's specimen is without an original ticket, and may be (I think probably is) from Malacca or thereabout. The species is very near *O. Wallichii*; there is no distinction in the hairiness or position of the sori: *O. Wallichii* is more often hairy than glabrous; *O. Cumingii* sometimes has the sori quite close to the midrib.

32. POLYPODIUM, Linn.

Desmobryoid series. Stipes continuous with the rhizome. Sori across the veins.

Subgenus I. *Phegopteris*. Veins all free.

* *Frond 1-pinnate or sub-2-pinnate.*

1. *P. SCOTTII*, Bedd. Ferns Brit. Ind. t. 345. Stipes tufted, with many linear-subulate brown-black scales; frond 1-pinnate, main rhachis with hair-like scales; pinnæ alternate, 6–7 approximated pairs, ovate-oblong, obtuse, falcate, serrate, glabrous except a few weak setæ or scales on the veins beneath.

Sikkim; Government Cinchona Plantation, alt. 2000 feet, *J. Scott*.

Unknown at Kew: the above abstracted from Beddome, who observes (Ferns Brit.

Ind. Suppl. p. 19) that the fern is perhaps an abnormal (exinvolucrate?) form of *Lastrea hirtipes*, which it resembles in the venation and in the size and situation of the sori.

2. *P. ERUBESCENS*, Wall. Cat. 330. Stipes tufted; frond large, not attenuated into the stipe; main rhachis with patent soft white hairs or glabrous; pinnæ cut down nearly to the midrib, glabrous on the surface beneath, lobes narrowly oblong, sub-acute; sori very close to the midrib of the lobes.—Hook. Sp. Fil. iv. 236; Bedd. Ferns Brit. Ind. t. 213; Hk. & Baker, Syn. Fil. 306.

From Kashmir to Bhotan and Khasia; alt. 3000–7000 feet; common in the Western Himalaya, somewhat rare in Sikkim and Khasia.—Distrib. Malay Peninsula and Islands.

3. *P. APPENDICULATUM*, Bedd., not of Wall. & Baker. Frond 1–2 feet, lanceolate, not attenuate at the base; main and partial rhachises with spreading needle-like hairs; pinnæ cut down nearly to the midrib, more or less hairy on both surfaces, not distinctly gland-bearing at the base; lobes oblong, rounded or scarcely acute; sori nearer the midrib of the lobes than the margin.—Bedd. Ferns Brit. Ind. t. 256.

Nepaul; near Sanko, *Winterbottom*. Bhotan and Khasia, *Griffith*.

A rare fern. It differs from *P. auriculatum* by being smaller and more slender, by the absence of the auricles, and by being truncate at the base. I here describe as *P. appendiculatum* the fern collected by Winterbottom, figured by Beddome. *Aspidium appendiculatum*, Wall. Cat. 349, is as to the type sheet *Nephrodium canum*, Baker: among the duplicates of Wall. Cat. 349, are four or five different species, but nothing polypodioid except a type specimen of *Polypodium erubescens*. Baker's *Polypodium appendiculatum* (Hk. & Baker, Syn. Fil. 306) does not suit any one fern. It might be better to drop the name *appendiculatum* altogether.

Var. *squamæstipes*. Stipe clothed its whole length with large ovate obtuse brown scales, some extending to the main rhachis. (Pl. LXXIX. fig. 2.)

Sikkim, alt. 6000 feet, Simonbong, *C. B. Clarke*.—This may be a new species. The stipe is clothed with minute pendent short pubescence, not much resembling the needle-like hairs of *P. appendiculatum*.

4. *P. AURICULATUM*, Wall. Cat. 314. Frond large, lanceolate, attenuate at the base; stipe and main rhachis coarsely villous; pinnæ cut down nearly to the midrib, often bearing a prominent gland at their base; lobes broadly oblong obtuse; sori nearer the midrib than the margin.—Hook. Sp. Fil. iv. 237, excl. var.; Bedd. Ferns Brit. Ind. t. 203; Hk. & Baker, Syn. Fil. 306.

From Gurwhal to Bhotan, alt. 5000–8000 feet; plentiful about Darjeeling. Khasia, Myrung Wood, alt. 5000 feet; *Hook. f. & T. Thoms*.—Distrib. Java.

Stipe often with many ovate persistent succulent scales. Glands at the base of the pinnæ sometimes produced into linear hooks $\frac{1}{3}$ – $\frac{1}{2}$ in. long.

5. *P. PHEGOPTERIS*, Linn. Sp. Pl. 1550. Rhizome slender, creeping; stipe with large lanceolate yellow-brown scales near its base; lowest pinnæ as long, or nearly as long, as any above them; main rhachis beneath with small ovate scales; pinnæ cut down nearly to the main rhachis, more or less pilose on both surfaces; lobes oblong, scarcely acute, entire or crenate; sori near their margins.—Schk. Krypt. Gew. t. 20; Engl. Bot. t. 2224; Hook. Brit. Ferns, t. 3, Sp. Fil. iv. 245; Hk. & Baker, Syn. Fil. 308. *Phegopteris vulgaris*, Mett. Fil. Hort. Lips. 83. *P. polypodioides*, Fée; Milde, Fil. Europ. 100.

Kashmir; above Sonamurg, alt. 11,000 feet, *H. C. Levinge*.—Distrib. North Europe, Asia, and America; Caucasus, Japan.

As to *Polypodium Thelypteris*, Engl. Bot. t. 1018, Sir W. J. Hooker and Newman hold it to be *P. Phegopteris*; Milde quotes it (Fil. Europ. 100) as *Phegopteris polypodioides*, and again (Fil. Europ. 117) as *Aspidium Thelypteris*. I have above (under *Nephrodium Thelypteris*) given my grounds for believing Engl. Bot. t. 1018 to be what Sir J. E. Smith intended it.

6. *P. DISTANS*, Don, Prodr. Fl. Nep. 2. Stipes tufted, squamose near the base; frond elongate, the lower pinnæ reduced distant; primary rhachises villous or puberulous beneath; pinnæ cut down nearly to the midrib; lobes oblong, entire or crenate.—Hk. & Baker, Syn. Fil. 308. *P. paludosum*, Blume, Fl. Jav. Fil. 192, t. 90; Hook. Sp. Fil. iv. 244; Bedd. Ferns South. Ind. t. 168. *P. longipes*, Wall. Cat. 316. *P. Griffithii*, Hook. Sp. Fil. iv. 236. *Aspidium paludosum*, Blume, Enum. Pl. Jav. 168.

From Kashmir to Bhotan, alt. 3000–8000 feet; very common. Khasia; alt. 3000–5000 feet, very common.—Distrib. South India, Ceylon, Malaya.

Very difficult to distinguish from *Gymnogramme aurita*, which has ovate rather than oblong lobes, and oblong rather than orbicular sori; the rhizome is rarely present in herbaria. The following varieties, though differing considerably in cutting, are united with the type by intermediates.

- Var. 1. *adnata*, (sp.) Wall. Cat. 328. Frond broadly lanceolate, bipinnate; secondary pinnæ crenate or subpinnatifid.—*P. brunneum*, Wall. Cat. 333. *Nephrodium microstegium*, Hook. Sp. Fil. iv. 119, t. 250. *Lastrea microstegia*, Bedd. Ferns Brit. Ind. t. 39.

Extends nearly over the whole area of *P. distans* type.—Sir W. J. Hooker's specimen, from which his figure t. 250 was drawn, is a very common form of *P. distans*; but I cannot help suspecting that Sir W. J. H. must have mixed with it the fern above described as *Nephrodium Boryanum*, var. *microstegioides*, which is the plant that in Bengal was always supposed to be the true *Nephrodium microstegium*.

- Var. 2. *glabrata*. Frond large, long lanceolate; main rhachis shining black; partial rhachises glabrous beneath.

Sikkim, alt. 10,000–12,000, *W. S. Atkinson* and *C. B. Clarke*.

Var. 3. *minor*. Frond small; pinnæ 1-2 in. long, cut scarcely halfway down to the midrib. (Pl. LXXIX. fig. 1.)

Sikkim, alt. 500-2000 feet, *C. B. Clarke*.—In the first stage of fruiting there is an excessively thin scale over the sorus in this form.

** *Frond 2- (or 3-) pinnate.*

7. *P. SUBTRIPINNATUM*, *C. B. Clarke*. Frond 5 feet by 4, slightly pubescent on the rhachises beneath, otherwise glabrous; tertiary pinnæ (not quite free) $\frac{3}{4}$ by $\frac{1}{8}$ in., broadly oblong obtuse, crenate or obtusely subpinnatifid; sori very large, hemispherical. (Pl. LXXX. fig. 1.)

Sikkim, alt. 6500 feet; Neebay on the Upper Ratong, *C. B. Clarke*. Once collected. Thin, green in texture; the sori, not far advanced, show no traces of involucre. Most resembling *Nephrodium Boryanum*, var. *microstegioides* in cutting; but the large hemispherical sori visible from the upperside of the frond indicate *Polypodium* rather than *Lastrea*.

8. *P. DRYOPTERIS*, Linn. Sp. Pl. 1555. Rhizome creeping; stipe with lanceolate-subulate scales near the base; frond 3-8 in., deltoid, 3-pinnate, thin, green, nearly glabrous, often glandulose.—Engl. Bot. t. 616; Schk. Krypt. Gew. t. 25; Hook. Brit. Ferns, t. 4, Sp. Fil. iv. 250; Bedd. Ferns Brit. Ind. t. 74; Hk. & Baker, Syn. Fil. 309. *P. Robertianum*, Hoffm.; Hook. Brit. Ferns, t. 5, Sp. Fil. iv. 250. *P. calcareum*, Engl. Bot. t. 1525. *Phegopteris Dryopteris* and *Robertiana*, Milde, Fil. Europ. 98, 99.

Kashmir, alt. 7000-11,000 feet, frequent, extending thence eastwards to Kumaon.—Distrib. Arctic and Alpine Europe, Asia, and America.

Some of the Indian examples are very large and very glandulose. Milde still maintains *P. Dryopteris* and *P. Robertianum* to be distinct species; but I cannot make his diagnosis divide the Kew bundles. If *P. Robertianum* be distinct, it grows in the West Himalaya.

9. *P. ORNATUM*, Wall. Cat. 327. Stipe and lower part of main rhachis with lanceolate-linear persistent scales, often muricate or scabrous from their persistent bases, but not pilose nor viscous; frond 3-pinnate, sub-4-pinnate; ultimate pinnæ pilose, with needle-like patent hairs.—Bedd. Ferns South. Ind. t. 171. *P. pallidum*, Brack.; Hook. Sp. Fil. iv. 266. *Nephrodium tenericaule*, Hook. Sp. Fil. iv. t. 269, not the description.

From Kumaon to Bhotan, in tropical valleys, alt. 0-2000 feet, common. Chittagong Hills, alt. 500 feet, *C. B. Clarke*.—Distrib. South India, Ceylon, Malaya, North Australia, Polynesia.

This common Indian fern is at once recognized by the very firm scales on the stipe and main rhachis, the persistent bases of which often make the stipe very rough;

otherwise, as to cutting and the needle-like hairs, it resembles *Nephrodium setigerum*, Baker. It varies greatly in size; fronds of 15–20 feet occur, while I have fronds 10 in. long in full fruit.—As to the synonymy of this fine species, Beddome's figure quoted is the true plant, as is plain from his description; but it does not show the rhachises of the primary and secondary pinnæ paleaceous, which is the best character of the species. For the synonym, *P. pallidum*, Brack., Kew possesses authentic examples from Brackenridge. Several examples communicated from Malaya named *Aspidium uliginosum*, Kunze, are *P. ornatum*, Wall.; but the original description of Kunze (in Linnæa, xx. 6) does not suit well. *Cheilanthes pallida* of Blume is cited as a synonym by Mettenius; but the example from Blume is *Hypolepis*, as Mr. Baker states. *Polypodium trichodes*, Reinw., Lowe, Ferns, ii. t. 2, means, I believe, *Nephrodium setigerum*, Baker; but there is some *P. ornatum* about marked *P. trichodes*. For the Queensland locality there is an example communicated by Baron F. Mueller marked by him "*Polypodium rugulosum*, var. *hirsutum*, reminds of *P. tenericaule*."

10. *P. RUGOSULUM*, Labill. Fl. Nov. Holl. ii. 92, t. 241. Rhizome creeping; stipe and lower part of main rhachis viscous-puberulous or viscous-pubescent, without pales or long hairs; frond 3-pinnate.—*P. punctatum*, Thunb. Fl. Jap. 337; Hk. & Baker, Syn. Fil. 312; Benth. Fl. Austral. vii. 764. *P. marginale*, Wall. Cat. 322, only part of type sheet. *P. rugulosum*, Hook. Sp. Fil. iv. 272; Bedd. Ferns South. Ind. t. 170. *Phegopteris rugulosa*, Fée; Mett. Farngatt. Pheg. & Asp. 12. *Hypolepis hostilis*, Presl (at least as to Hohenacker's Nilgherry plants). *Aspidium divisum*, Wall. Cat. 393, partly.

Very common in the hills from Chumba to Bhotan and Chittagong; alt. 1000–5000 feet.—Distrib. South India, Ceylon, Malaya. Nearly throughout the tropics and south temperate zone, especially near the sea, extending to Japan, New Zealand, St. Helena, and Chili; not from continental Africa.

This fern is also marked *Polypodium viscosum*, Roxb., and (in Herb. Kurz) *P. viscosum*, Zipp.; but I do not know where those names are published. This fern has been confused with *Hypolepis tenuifolia*, which much resembles it in outline; but, besides the non-marginal sori, *P. rugosulum* may be distinguished by the very viscous rhachis.

11. *P. SUBDIGITATUM*, Blume, Fl. Jav. Fil. 196, t. 93. Stipes tufted; frond 3–4-pinnate; ultimate segments small; texture thin, green, glabrous.—Bedd. Ferns Brit. Ind. t. 229; Hk. & Baker, Syn. Fil. 340. *P. conifolium*, Wall. Cat. 326. *P. davallioides*, Mett. Farngatt. Polypod. 32; Hook. Sp. Fil. iv. 256. *Aspidium subdigitatum*, Blume, Enum. Pl. Jav. Fil. 171. *Monachosorum davallioides*, Kunze, Farnkr. Schk. Suppl. II. i. t. 101.

From Nepaul to Bhotan; alt. 6000–9000 feet, common.—Distrib. Malay Peninsula and Islands.

Placed in *Phegopteris* by Sir W. J. Hooker; I have no doubt correctly. The stipes are continuous with the rhizome; the sori are not terminal on the veins; authors have perhaps on this point accepted Kunze's picture, instead of putting a scrap under

the microscope. The veinlets are not divided where the sorus is placed, but are carried beyond its centre of attachment, sometimes a very little way, sometimes distinctly beyond the circle of the sorus (see Pl. LXXX. fig. 2). Involucre none that I can find in the youngest stage. Beddome's suggestion (Ferns Brit. Ind. Suppl. p. 21) that the genus is *Leucostegia* will not do at all.

Subgenus II. *Goniopteris*. Lowest pair of veinlets (and often some others) uniting into a veinlet carried to the sinus, not otherwise branching. Veinlets all carried to the margin. Sori all across the veinlets, none terminal. Fronds large, pinnate (in the Indian species).

Nearly all the species of this section are referred by Col. Beddome to *Eunephrodium*, as he finds a very thin involucre present in the earliest stage of fruiting. It is doubtful whether some of the species are not mere duplicates of those referred to *Eunephrodium*.

12. *P. UROPHYLLUM*, Wall. Cat. 299. Rhizome shortly creeping; stipes approximate, with lanceolate-linear brown scales on their lower half; pinnæ narrow-oblong, caudate-acuminate, margin crenate or slightly serrate, surface glabrous above, often glandulose-punctate beneath, veins and margin nearly always with some minute pubescence; young sori orbicular, but distant from the main veinlets, and often confluent in age.—Hook. Sp. Fil. v. 9 (excl. syn.); Hk. & Baker, Syn. Fil. 314; Benth. Fil. Austr. vii. 765. *Goniopteris lineata*, Bedd. Ferns Brit. Ind. t. 3. *Phegopteris urophylla*, Mett. Farnagatt. Pheg. & Asp. 26.

From Gurwhal to Bhutan and Chittagong, alt. 1000–5000 feet; common.—Distrib. South India, Ceylon, Malaya, North Australia, Polynesia.

This fern is said to be difficult to distinguish from *N. glandulosum* and from *Meniscium cuspidatum*; but, so far as the North-India material is concerned, there is not much difficulty. In *Nephrodium glandulosum* the involucre is distinct, not at all difficult to find, and the upper surface of the frond is strigose. In *Meniscium cuspidatum* the young sori are linear, and often extend nearly to the midribs (as well as to the junction-veinlet); the frond is without pubescence.—The real difficulty is to distinguish *P. urophyllum* from *P. multilineatum*. Col. Beddome says (Bedd. Ferns Brit. Ind. Suppl. p. 18) that his own picture of *Nephrodium lineatum* is our *P. urophyllum*; and I can find no difference in the Herbarium bundles, except that *P. urophyllum* is the name given to the less deeply serrated specimens: I see no line at all.

Var. *khassiana*. Margin of the pinnæ entire; veins very red; sori exactly round.

Khasia and Sikkim.—Marked by Col. Beddome *Nephrodium lineatum*, Presl; referred by Mr. Baker to *P. rubrinerve*; but the fact is that this var. *khassiana* has a more entire margin than *P. rubrinerve* or *P. meniscioides*, and is perhaps better entitled to be marked a species than many species of *Goniopteris* admitted by Baker. The sori are particularly exinvolucrate, though I do not say that there may not be a thin covering in the first stage, as Beddome calls it *Nephrodium*.

13. *P. MULTILINEATUM*, Wall.; Hook. Sp. Fil. v. 11. Pinnæ narrow-oblong, caudate-

acuminate, margin sharply serrate, pubescent beneath, or at least dular; sori often near the main veinlets, never confluent.—Hk. & Baker, Syn. Fil. 316. *Goniopteris multilineata* and *Penangiana*, Bedd. Ferns Brit. Ind. tt. 231, 232.

Throughout North India, alt. 0–5000 feet, very common, extending over the plain of Bengal.—Distrib. As of *P. urophyllum*?

This differs from *P. urophyllum* by having the margin of the pinnæ more deeply serrate, the sori not confluent. One of my examples has very large glands at the base of the pinnæ.

14. *P. LINEATUM*, Colebr. in Wall. Cat. 300. Pinnæ linear, acutely denticulate, glabrous beneath; sori generally near the main veinlets, never confluent.—Hk. & Baker, Syn. Fil. 316. *Goniopteris lineata*, Bedd. Ferns Brit. Ind. t. 220.

From Nepaul to Kumaon; apparently a high-level fern.—Distrib. Ceylon.

Tolerably distinct from *P. multilineatum* by its narrower very glabrous pinnæ; they are generally glabrous or nearly so even on their rhachises above. Young sori with many hairs among them; involucre *fide* Beddome.

Var. *Penangiana*, (sp.) Hook. Sp. Fil. v. 13. Pinnæ much broader, doubly-serrate.

Penang, Ceylon.—The Khasi specimen of Griffith placed here is without fruit and doubtful.

15. *P. PROLIFERUM*, Roxb., Wall. Cat. 312, in Calc. Journ. Nat. Hist. iv. 489, t. 32, not of Kaulf. Rhizome creeping; frond often flagelliferous, rooting at the top, also branched by new complete pinnate fronds springing from the axils of the pinnæ.—Hook. Sp. Fil. v. 13; Hk. & Baker, Syn. Fil. 315; Benth. Fl. Austral. vii. 765. *P. luxurians*, Kunze in Linnæa, xxiii. 280. *Meniscium proliferum*, Swartz; Hook. 2nd Cent. Ferns, t. 15. *Goniopteris prolifera*, Presl; Bedd. Ferns South. Ind. t. 172. *Phegopteris luxurians*, Mett. Farngatt. Pheg. & Asp. 25; not *Ph. prolifera*, Mett. Fil. Hort. Lips. 84. *Ampelopteris elegans*, Kunze in Bot. Zeit. vi. 114. *A. firma*, Kunze in Linnæa, xxiv. 251.

Throughout the plain of North India, alt. 0–1000 feet, abundant.—Distrib. South India, Ceylon, Burma, Malaya, North Australia, Tropical and South Africa.

Very abundant in ditches and among damp old brickwork; ascends the hills but a very little way. The young sori are round or oblong, usually becoming confluent in age, and often covering ultimately the whole surface of the frond beneath. In some examples the sori seem almost linear in an early stage of ripening; and the fern might be supposed a *Meniscium*.

Subgenus III. *Dictyopteris*. Frond 1–2-pinnate, lowest pinnæ the largest (in the North-Indian species). Lowest pair of veinlets in the ultimate pinna, at least in the lower part of the barren frond, uniting; veinlets in the ultimate lobes often ramifying.—This only differs from *Pleocnemia* by the absence of an involucre.

16. *P. CHATTAGRAMICUM*, C. B. Clarke. Rhizome short, stout; stipes tufted, long, black,

with small scales near the base; fronds distinctly dimorphic, 1-pinnate; lower pinnae subpinnate, minutely pubescent, the margin with minute golden multicellular hairs; sori naked, many across the veins, many terminal on them. (Pl. LXXXI.)

Chittagong; very general, alt. 250 feet, *C. B. Clarke*.

This species comes next *P. tenerifrons*, Hook., from Moulmein, which differs, having a creeping rhizome, very slender weak green (not black) stipes; fronds not dimorphic, very tender, sori all across the veins.—There is placed in *P. tenerifrons* a sketch made by Sir J. D. Hooker in Chittagong: I have little doubt it relates to *P. chattagramicum*.—N.B. Chattagram is the word better known in its Portuguese corruption, Chittagong.

Eremobryoid series. Stipes articulated on the rhizome. Sori often terminal on the veins.

Subgenus IV. *Eupolypodium*. Veins all free. (Frond linear, pinnatifid or sub-1-pinnate.)

17. *P. KHASIANUM*, Hook. Sp. Fil. iv. 191, 2nd Cent. Ferns, t. 49. Stipes tufted, short; frond simple, 4–14 by $\frac{1}{2}$ –1 in., pinnatifid nearly to the main rhachis, sparingly hairy.—Bedd. Ferns Brit. Ind. t. 173; Hk. & Baker, Syn. Fil. 325.

Khasia, alt. 3000–4000 feet; near Cherra, *Hook. f. & T. Thoms.* Assam, *Jenkins*. From Cherra to Jowye and Jarain in Jaintea, alt. 3000–4000 feet, *C. B. Clarke*; not plentiful anywhere.

18. *P. TRICHOMANOIDES*, Swartz, Syn. Fil. 33. Stipes tufted, short; frond simple, deeply pinnatifid or 1-pinnate, 2–6 by $\frac{1}{4}$ – $\frac{1}{3}$ in., sprinkled with long black-red persistent hairs; lobes monosorous.—Schk. Krypt. Gew. t. 10; Mett. Farngatt. Polypod. 40; Hook. Sp. Fil. iv. 178; Bedd. Ferns Brit. Ind. t. 2; Hk. & Baker, Syn. Fil. 326. *P. truncicola*, Klotzch; Mett. Farngatt. Polypod. 40; Hook. Sp. Fil. iv. 178. *P. gibbosum*, Fée, 6^{me} Mém. Foug. Nouv. 8, t. 2. fig. 2. *P. serricula*, Fée, l. c. 9, t. 7. fig. 1.

Sikkim, alt. 9000–12,000 feet, *Sir J. D. Hooker*, *C. B. Clarke*; not rare.—Distrib. Andes.

An Alpine fern. The solitary Malacca specimen placed in the Kew bundle is totally different; *inter alia* is glabrous.

[*P. parvulum*, Bory, is stated in Hk. & Baker, Syn. Fil. 326, to be found in North India; but all the North-Indian examples have the rhizome tufted, and have since been referred to *P. subfalcatum*, Blume.]

[*P. obliquatum*, Blume, is stated (in Bedd. Ferns Brit. Ind. Suppl. p. 2) to be “general” in India; but I can find no example from North India.]

19. *P. SUBFALCATUM*, Blume, Fl. Jav. Fil. 186, t. 87 A, B. Rhizome tufted; fronds 2–10 by $\frac{1}{2}$ –1 in., 1-pinnate, sparingly hairy; pinnae crenulate, polysorous.—Mett. Farngatt. Polypod. 52; Hook. Sp. Fil. iv. 193; Bedd. Ferns Brit. Ind. t. 189 A; Hk. & Baker, Syn. Fil. 328. *P. parvulum*, Bedd. Ferns South. Ind. t. 166, not of Bory.

Himalaya, alt. 5000–9000 feet; from Gurwhal to Bhotan; common. Khasia, alt. 4000–5000 feet; *C. B. Clarke*, frequent.

Some of the Khasi specimens are not larger than *P. trichomanoides*, and ciliate nearly as *P. trichomanoides*; but the sori are more than one to each lobe.

Subgenus V. *Goniophlebium*. Fronds 1-pinnate or sub-1-pinnate. Sori terminal on a free veinlet, one included in each costal arch of the pinnæ.

20. *P. AMÆNUM*, Wall. Cat. 290. Rhizome stout, as thick as a small quill, densely clothed with grey-brown lanceolate-subulate scales, which are subadpressed, never hair-pointed; near the base of the main rhachis are sometimes ovate or lanceolate scales; lower pinnæ not quite free; costal arches of the main rhachis continued nearly or quite to the base of the frond; main rhachis above pubescent.—Mett. Farngatt. Polypod. 80; Hook. Sp. Fil. v. 24; Hk. & Baker, Syn. Fil. 341. *Goniophlebium amœnum*, J. Smith; Bedd. Ferns Brit. Ind. t. 5.

Himalaya, alt. 4000–11,000 feet; from Gurwhal to Bhotan, very common. Khasia; alt. 3000–6000 feet, very common. (I doubt whether the Formosa examples belong.)

I can only distinguish this from some of the large specimens of *P. lachnopus* by the scales not being hair-pointed. There is no difference in the cutting between the two, and I have *P. lachnopus* exceedingly large.

Var. ? *tonglensis*. Frond 2–5 in.; veins wider apart than in the typical *amœnum*.

Tonglo, Sikkim, alt. 1000 feet, *C. B. Clarke*.—I can make nothing of this: the rhizome and scales are exactly as in *P. amœnum*; pinnæ subobtusate, glaucous beneath, none free.

21. *P. SUBAMÆNUM*, C. B. Clarke. Rhizome slender, densely clothed with grey-brown lanceolate-subulate scales, which are subadpressed never hair-pointed; near the base of the main rhachis are sometimes ovate or lanceolate scales; lower pinnæ not quite free; costal arches of the main rhachis continued nearly or quite to the base of the frond; main rhachis above glabrous or puberulous. (Pl. LXXXII. fig. 2.)

Dividing ridge between Sikkim and Nepaul, alt. 11,000–12,000 feet; in great quantity.

Very close to *P. amœnum*, from which it is separable by its slender rhizome and small size. I found it arranged at Kew under *P. Hendersoni*, which is not very near it. The frond of *P. amœnum* is broader, less fully pinnate, the pinnæ less markedly serrate (besides the characters in the above diagnosis).

22. *P. HENDERSONI*, W. S. Atkinson; Hk. & Baker, Syn. Fil. 2nd ed. 511. Rhizome somewhat slender, glaucous, densely clothed with hair-pointed brown-black scales, spreading from small ciliate bases; stipe and base of the main rhachis often with similar scales; lower pinnæ usually quite free; costal arches of the main rhachis broken towards the base of the frond; main rhachis above glabrous.—*Goniophlebium Hendersoni*, Bedd. Ferns Brit. Ind. Suppl. p. 21, t. 383.

Dividing ridge between Sikkim and Nepaul, and north to Jongri, alt. 11,000–18,000 feet; in great quantity.

23. *P. LACHNOPUS*, Wall. Cat. 310, chiefly. Rhizome (slenderer than in *P. amœnum*) densely clothed with hair-pointed brown-black scales, spreading from small bases; base of the rhachis often with a few similar scales; lowest pinnæ usually (not always) quite free; costal arches of the main rhachis usually broken, at least in the lower half of the frond; main rhachis above pubescent.—Hook. Sp. Fil. v. 25, 2nd Cent. Ferns, t. 52; Mett. Farngatt. Polypod. 75; Hk. & Baker, Syn. Fil. 342. *Goniophlebium lachnopus*, Bedd. Ferns Brit. Ind. t. 163.

Himalaya, from Kashmir to Bhotan; alt. 2000–6000 feet; very common. Khasia, alt. 3000–5000 feet, very common.

Baker and Beddome carry this fern up to 11,000 feet alt., but my highest level for it is 5600. It has been, in fact, in Herbaria hopelessly intermixed with other species; and Wallich's original *P. lachnopus* has *P. microrrhizoma* mixed on the same sheets. It is hopeless, therefore, to disentangle the synonymy completely. *P. Fieldingianum*, Kunze, is described by Mettenius (Farngatt. Polypod. 75) as very glabrous, and may be *P. microrrhizoma*; but Mettenius worked with scraps and no rhizomes, and the specimen he has marked with his own hand *P. lachnopus* is *P. microrrhizoma*.

24. *P. MICRORRHIZOMA*, C. B. Clarke; Hk. & Baker, Syn. Fil. 2nd ed. 511. Rhizome slender, clothed with grey-brown ovate or lanceolate scales, not hair-pointed; base of the rhachis often with a few similar scales; lowest pinnæ mostly quite free; costal arches of the main rhachis usually broken, at least in the lower half of the frond; main rhachis above glabrous.—*P. lachnopus*, Wall. Cat. 310 as to $\frac{1}{2}$ type sheet. *Goniophlebium microrrhizoma*, Bedd. Ferns Brit. Ind. p. 21, t. 384.

Kashmir to Bhotan; alt. 5000–9000 feet, very common.

25. *P. ARGUTUM*, Wall. Cat. 308. Scales of the rhizome ovate-acute, short, much spreading; lower pinnæ distant, narrowed at the base or subsessile, rarely much narrower than the pinnæ above them.—Hook. Sp. Fil. v. 32; Hk. & Baker, Syn. Fil. 2nd ed. 511. *Goniophlebium argutum*, Bedd. Ferns Brit. Ind. t. 6.

Himalaya, from Kashmir to Bhotan, alt. 4000–9000 feet, very common.

Hardly separable from *P. subauriculatum*; Major Henderson would prefer to unite the two. The lower pinnæ are sometimes much the narrower. The best distinction I make to be the spreading (but not caudate-acuminate) scales on the rhizome; but Mr. Baker says the scales are "linear-subulate." The pinnæ are sometimes sessile, subdecurent, sometimes subpetiolate. One of my examples has the venation unusually lax, the sori oblong.

26. *P. SUBAURICULATUM*, Blume, Enum. Pl. Jav. Fil. 133, Fl. Jav. Fil. 177, t. 83. Scales of the rhizome linear-subulate, often hair-pointed; lower pinnæ distant, widened, subauriculate at the very base, rarely much narrower than the pinnæ above them.—

Mett. Fil. Hort. Lips. 33, t. 23. fig. 10; Carr. in Fl. Viti. 367; Hook. Sp. Fil. v. 32; Hk. & Baker, Syn. Fil. 344; Benth. Fl. Austral. vii. 771. *Goniophlebium subauriculatum*, De Vriese; Bedd. Ferns Brit. Ind. t. 78.

Khasia, alt. 3000–5000 feet, very common.—Distrib. Malaya, Queensland.

The Khasi examples have the pinnæ wider, more auriculate at the base, less serrate than the Malay. The form *Goniophlebium serratifolium*, Brack., in Malaya, Queensland, and Polynesia, differs more than does *P. argutum*. Col. Beddome (Ferns Brit. Ind. Suppl. p. 21) attributes *P. verrucosum*, Wall., to North India. In the Kew bundle there are no examples north of Malacca and Penang; but except as to the sori forming papillæ on the upper surface of the frond, I see little difference between the two; and possibly Col. Beddome sorts the material differently.

Subgenus VI. *Niphobolus*. Fronds simple, linear, entire (or partially irregularly lobed), the under surface (at least about the young sori) with stellate scales or hairs. Veins obscure, looping; areola containing 2 or more sori.

27. *P. ADNASCENS*, Swartz, Syn. Fil. 25, 222, t. 2. fig. 2. Rhizome slender, tough, wide-creeping on trees; scales at the base of the scattered stipes lanceolate-linear, often hairy; fronds similar, or the barren smaller than the fertile, 2–10 in.; sori in the upper part of the frond, when young bursting through the dense stellate tomentum, when ripe elevated; barren part of the frond with thin stellate tomentum or nearly glabrous.—Wall. Cat. 268; Hook. Sp. Fil. v. 47; Hk. & Baker, Syn. Fil. 349. *P. pertusum*, Roxb. in Calc. Journ. Nat. Hist. iv. 483; Wall. Cat. 267; Hook. Exot. Fl. t. 162; Mett. Farngatt. Polypod. 125. *P. vittarioides*, Wall. Cat 270; Mett. Farngatt. Polypod. 126. *P. caudatum* and *varium*, Mett. l. c. *Niphobolus adnascens*, Kaulf.; Carr. in Fl. Viti. 367; Hook. Garden Ferns, t. 19; Bedd. Ferns South. Ind. t. 184. *N. lævis*, Bedd. Ferns Brit. Ind. t. 161. *N. varius*, Kaulf.; Blume, Enum. Pl. Jav. Fil. 106, Fl. Jav. Fil. t. 21. *N. elongatus*, Blume, Fl. Jav. Fil. t. 20. *N. caudatus*, Kaulf.; Blume, Fl. Jav. Fil. t. 22.

Throughout North India in moist climates; alt. 0–3000 feet, abundant; extending over the plains to Calcutta and the sea-face of the Soonderbun.—Distrib. South India, Ceylon, Malaya, China.

Very common throughout the plain of Bengal. The fronds are usually uniform, but sometimes the barren fronds are shorter and blunter than the fertile. The immersion of the sori is by no means a constant character. The large examples from Sikkim and Cachar have been placed by Mr. Baker with *P. acrostichoides*; but *P. acrostichoides* has the scales at the base of the stipe obtuse. I observe that Mr. Thwaites discriminates the two species my way. The scales on the long creeping rhizome sometimes are much the same in the two species; but in these (and allied *Polypodiums*) there is a tuft of scales encircling the stipe at its point of dehiscence from the rhizome; these are strikingly different in *P. adnascens* and *P. acrostichoides*.

28. *P. JAINTENSE*, C. B. Clarke. Rhizome very slender, tough, wide-creeping on trees; scales at the base of the scattered stipes lanceolate-linear, often hairy; stipes $\frac{1}{4}$ – $\frac{3}{4}$ in.,

with red hairs; fronds uniform, caudate, thinly grey tomentose beneath; sori in the upper part of the frond often somewhat scattered. (Pl. LXXXII. fig. 4.)

Jaintea; Jarain, alt. 3500 feet, *C. B. Clarke*; once collected.

Next *P. adnascens*, but slenderer; at once recognizable by the short hairy stipes.

29. *P. HETERACTIS*, Mett.; Kuhn, in Linnæa, xxxvi. 140. Rhizome somewhat stout, wide-creeping, with lanceolate-linear yellow-red scales; stipes distant, 1-5 in., more or less scaly or tomentose; fronds narrow-oblong acuminate, the fertile similar to the barren or somewhat narrower, covered beneath uniformly with stellate scales, the rays of which are lanceolate with filamentous hairs admixed.—*P. Lingua*, var.; Hk. & Baker, Syn. Fil. 2nd ed. 512; Bedd. Ferns Brit. Ind. Suppl. t. 385, not the scale?

Sikkim and Bhotan, alt. 4000-6000 feet, frequent. Khasia; alt. 3000-5000 feet, frequent.

All my North-Indian examples show the stellate scales with additional filamentous hairs, as insisted on by Kuhn; and the fronds are also more acuminate than in *N. Lingua*, Swartz. The other differences (regarding the breadth and dimorphism of the frond) do not hold, and the Indian should probably be regarded as a var. of the old Chinese and Japanese plant.

30. *P. STIGMOSUM*, Swartz, Syn. Fil. 29, 226. Rhizome short; stipes approximate, with lanceolate-linear scales at their base; frond usually 8-20 in., attenuate, decurrent at the base, uniformly clothed with short reddish-brown tomentum beneath; sori very small, continuous in 8-12 rows between the main veins.—Hk. & Baker, Syn. Fil. 350. *P. costatum*, Wall. Cat. 265, type sheet; Mett. Farngatt. Polypod. 131, t. 3. fig. 14; Hook. Sp. Fil. v. 50. *Niphobolus venosus*, Blume, Fl. Jav. Fil. 63, t. 28. *N. costatus*, Bedd. Ferns Brit. Ind. t. 120.

Himalaya, alt. 2000-6000 feet; from Gurwhal to Bhotan, very common. Khasia; alt. 2000-3000 feet, very common. Chota Nagpore; Parasnath, alt. 2500 feet, *C. B. Clarke*.—Distrib. South India, Malay Peninsula and Islands.

31. *P. SUBFURFURACEUM*, Hook. Sp. Fil. v. 52. Differs from *P. stigmatosum* in having the tomentum beneath white, the sori much larger, distinct, in 4-6 rows between the main veins.—Hk. & Baker, Syn. Fil. 351. *Niphobolus subfurfuraceus*, Bedd. Ferns Brit. Ind. t. 259.

Bhotan and Mishmee, *Griffith*; 5 sheets of examples.

The largest example is $4\frac{1}{4}$ in. wide, but the smaller are narrower than much of *P. stigmatosum*. The fronds are attenuate at the base, but less decurrent on the stipe (so as to make it winged) than in *P. stigmatosum*. The stipe of *P. subfurfuraceum* is glabrous or nearly so.—The species is, I believe, good, founding it on the sori, but critical. The 5 sheets which I refer here are all *Griffith's*, but I have collected them out of various bundles of the Herbarium.

32. *P. NUMMULARIFOLIUM*, Mett. Farngatt. Polypod. 122, t. 3. figs. 9, 10, Rhizome

slender, tough, far-creeping, with lanceolate-linear scales; fronds tomentose, and with spreading stellate rufous hairs beneath; barren fronds suborbicular, $\frac{1}{2}$ –1 in., subsessile, fertile narrow-oblong, 1–3 in.—Hook. Sp. Fil. v. 44; Hk. & Baker, Syn. Fil. 351. *Niphobolus nummulariaefolius*, J. Smith; Bedd. Ferns Brit. Ind. t. 320. *Acrostichum nummulariaefolium*, Swartz, Syn. Fil. 191, 419, t. 2. fig. 1; Blume, Enum. Pl. Jav. Fil. 102, Fl. Jav. Fil. 33, t. 11. fig. 1.

East Bengal, alt. 0–2500 feet; Bhotan, Assam, Khasia, Cachar, generally scattered, nowhere common.—Distrib. Burma, Malaya.

Var. *obovatum*, (sp.) Mett. Farngatt. Polypod. 124. Barren fronds obovate, the stipes attaining sometimes $\frac{1}{2}$ – $\frac{3}{4}$ in.—Hook. Sp. Fil. v. 54. *Acrostichum obovatum*, Blume, Fl. Jav. 35, t. 11. fig. 3.

Khasia.—There is no authentic example at Kew of Blume's *Acrostichum obovatum*; but some Khasi examples agree perfectly with Blume's picture; and other Khasi examples show in the lower creeping part of the rhizome the barren pinnæ sessile round, while in the pendent parts of the same rhizome there are barren and fertile fronds mixed, the barren long obovate on stipes $\frac{1}{2}$ – $\frac{3}{4}$ in.

33. *P. fissum*, Hk. & Baker, Syn. Fil. 351. Rhizome short; frond attenuated at the base, so that the stipe is short or almost none; frond beneath tomentose, and with much loose ferruginous stellate woolly hair, venation obscure; sori somewhat large, scattered.—*P. porosum*, Wall. Cat. 266; Mett. Farngatt. Polypod. 128; Hook. Sp. Fil. v. 48. *P. mysurense*, Heyne, in Wall. Cat. 209. *P. sticticum*, Mett. Farngatt. Polypod. 128. *Niphobolus fissus*, Blume, Enum. Pl. Jav. Fil. 106; Blume, Fl. Jav. Fil. 58, t. 24. *N. porosus*, Bedd. Ferns South. Ind. t. 183. *N. sticticus*, Kunze, in Herb. Hohenack. no. 907, in Linnæa, xxiv. 257. *N. Schmidianus*, Kunze, in Bot. Zeit. vi. 121.

Himalaya, alt. 2000–7000 feet; from Kashmir to Bhotan, very common. Khasia, alt. 1000–5000 feet; very common.—Distrib. South India, Ceylon, Malay Peninsula and Islands.

Scales at the base of the stipe lanceolate-linear. Stipe stellately rufous-hairy. Margin of the frond often with irregular lobes, $\frac{1}{4}$ –5 in. long. Fronds $\frac{1}{2}$ –1 in. broad.

Var. *floccigerum*, (sp.) Mett. Farngatt. Polypod. 129. Fronds elongate, sometimes 16 by $\frac{1}{2}$ in.—*Niphobolus floccigerus*, Bedd. Ferns Brit. Ind. Suppl. t. 386.

Khasia.—This is certainly the only Khasi *floccigerum*, and Mettenius has marked the example: it is identical with *P. fissum*. Whether the figure of Blume (Fl. Jav. Fil. t. 26) was this I have doubts.—There is, however, but one North-Indian species here.

34. *P. flocculosum*, Don, Prodr. Fl. Nep. 1. Rhizome short; stipes 2–6 in., white-woolly; frond suddenly or gradually narrowed at the base, with white or brown stellate hair beneath, much less loose than that of *P. fissum*, less close than that of *P. heteractis*; sori in rows of 4–6 between the main veins.—Hk. & Baker, Syn. Fil.

351. *P. tomentosum*, Roxb. in Calc. Journ. Nat. Hist. iv. 483. *P. detergibile*, Hook. Sp. Fil. v. 49. *P. costatum*, Wall. Cat. 265, partly. *Niphobolus detergibilis*, Bedd. Ferns Brit. Ind. t. 162.

Himalaya, alt. 0–5000 feet; from Gurwhal to Bhotan, common. Khasia, alt. 0–4000 feet, common; extending into Sylhet plain.

Often resembles *P. Lingua* (i. e. *Heteractis*), but has a much shorter rhizome.

35. *P. BOOTHII*, Hook. Sp. Fil. v. 53. Rhizome short, with lanceolate-linear bright chestnut-coloured scales; stipes long, often 8–12 in.; frond large, often 12–16 in., narrowed hardly attenuate at base, with much tomentum and lax red-brown stellate hair on the under surface extending over the broad prominent main rhachis; sori more irregularly scattered than in *P. flocculosum*, about 6–8 in each row between the main veins.—Hk. & Baker, Syn. Fil. 352. *Niphobolus Boothii*, Bedd. Ferns Brit. Ind. t. 258.

Bhotan, *Griffith*, *Nuttall*; 5 sheets in all.

P. subfurfuraceum has the frond much more attenuated at the base, the tomentum beneath whitened: the two are near.

Subgenus VII. *Dipteris*. Stipe forked close to its apex, bearing the frond in two similar halves. Frond deeply flabellate. Veins looped, forming innumerable areolæ. Sori numerous, scattered, small.

36. *P. WALLICHII*, R. Br. in Hk. & Grev. Ic. Fil. tt. 168, 169. Lower surface whitish or subferruginous, margin not toothed.—Wall. Cat. 287; Mett. Farngatt. Polypod. 119; Hook. Sp. Fil. v. 99; Hk. & Baker, Syn. Fil. 362. *Dipteris Wallichii*, Moore; Bedd. Ferns Brit. Ind. t. 80.

Khasia; alt. 0–4000 feet, in several places. Nearly all the material has come from the Iron Bridge at the Bor-pani, alt. 2000 feet. Hook. f. & T. Thoms. obtained it at Luckipoor, in Cachar, alt. 0–250 feet. I have also met with it in Jaintea at several places to the borders of the Naga country, alt. 4000 feet; and in quantity in Sylhet station, alt. 0–50 feet.

Rhizome stout, extensively creeping, hypogæous; scales black, very stiff, bristly. Stipes distant, erect, standing in groves, like those of *Nephrodium heterosorum*, in wet flats.

Subgenus VIII. *Drynaria*. Fronds dimorphic, the barren one like an oak-leaf, the fertile much larger, pinnatifid (or in *P. conjugatum*, Lamk., these two kinds of fronds appear as though fused into one). Veins copiously inarching.

37. *P. QUERCIFOLIUM*, Linn. Sp. Fil. 1547. Rhizome stout, abbreviated; scales at the foot of the stipe linear, hair-pointed, pubescent, from a small ovate, fimbriate base; frond glabrous; lobes of the barren frond obtuse, main veins of the fertile distinct, carried in parallel lines to the margin.—Schk. Krypt. Gew. t. 13; Roxb. in Calc. Journ. Nat. Hist. iv. 484, t. 30; Wall. Cat. 291, chiefly; Hook. Sp. Fil. v. 96,

syn. excl.; Hk. & Baker, Syn. Fil. 367; Benth. Fl. Austral. vii. 772, excl. syn. *Drynaria quercifolia*, J. Smith; Bedd. Ferns South. Ind. 187.

A very common plains fern on trees and walls, extending from the sea-face of the Soonderbun to the base of the hills, but ascending them a very little way; it is as it were immediately replaced by *P. propinquum* there.—Distrib. Throughout India, Malaya, South China, to North Australia and Polynesia (but the material from the latter localities seems nearly all *P. Linnæi*).

Young plants of this are very polymorphic, and sometimes have the barren fronds lanceolate, sessile, entire, the fertile linear entire, on a long stipe; the same plants, as they get strong with age, throw normal fronds.—Linnæus included probably (under the name *P. quercifolium*) *P. Linnæi* also, which has the scales at the base of the stipe obtuse; the segments of the frond shorter, broader, thicker; for Linnæus quotes Rheede, Hort. Mal. xii. t. 11, which looks like *P. Linnæi*. Mr. Baker has separated specifically *P. Linnæi*, while Mr. Benth, l. c., ignoring the scales, unites it again. At all events the form *P. Linnæi* is not known from North India.

38. *P. PROPINQUUM*, Wall. Cat. 293, chiefly. Rhizome stout, shortly creeping; scales lanceolate-linear, pubescent; fronds glabrous; barren frond pinnatifid nearly to the main rhachis; lobes narrowed upwards or subacute; main veins of the fertile ramifying, not carried in distinct parallel lines to the margin.—Mett. Farngatt. Polypod. 120; Hook. Sp. Fil. v. 97; Hk. & Baker, Syn. Fil. 367. *P. Willdenovii*, Blume, Fl. Jav. Fil. t. 66; Hook. Garden Ferns, t. 35, not of Bory. *Drynaria propinqua*, J. Smith; Bedd. Ferns Brit. Ind. t. 160.

Himalaya, alt. 2000–7000 feet; from Gurwhal to Bhotan, very common. Khasia, alt. 2000–5000 feet, very common.—Distrib. Burma, Java.

The North-Indian material is very uniform and easily recognizable; the margin of the frond is entire or most minutely crenate, not in any example before me so much toothed as Beddome depicts. Blume's picture quoted is exactly the same plant; the details of the venation very correct. The Java example sent unfortunately is made up of a barren frond of *P. propinquum*, a fertile frond (tip only) of *P. longissimum*, and seems to have deceived many. The true African *P. Willdenovii* has a less cut barren frond, with obtuse lobes, and the main veins of the fertile frond distinct nearly to the margin; it seems to me nearer *P. quercifolium*. Mr. Baker has sorted many sheets of African into *P. propinquum*, Wall.; but it all seems to me *P. Willdenovii*.

39. *P. RIVALE*, Mett.; Hk. & Baker, Syn. Fil. 367. Fertile frond pinnatifid, sub-pinnate; lower lobes decreasing, decurrent, pubescent subciliate on the margin.—*Drynaria mollis*, Bedd. Ferns Brit. Ind. t. 216.

Gurwhal and Kumaon, alt. 6000–9000 feet, frequent.

The venation is that of other *Drynarias*, not of *Goniophlebium*.

40. *P. CORONANS*, Wall. Cat. 288. Frond (not dimorphic) appearing as though in

P. pinnatifidum, the stipe of the fertile frond had been increased by having the barren frond fused into it; hence all fronds cordate, sessile; main veins carried parallel to each other to the margin; sori large, confluent in a single row between the main veins.—Mett. Farngett. Polypod. 121, tt. 40, 41; Hook. Exot. Fl. t. 91, Sp. Fil. v. 95. *P. contiguum*, Wall. Cat. 285, only by admixture. *P. conjugatum*, Hk. & Baker, Syn. Fil. 366, not of Lamk. *Drynaria coronans*, Bedd. Ferns Brit. Ind. t. 13.

Himalaya, alt. 1000–4000 feet; from Nepal to Bhotan, rare. Khasia, alt. 1000–3000 feet, frequent. Chittagong Hills, alt. 500 feet, *C. B. Clarke*.—Distrib. South China.

P. conjugatum, Lamk. Encycl. v. 516, is an African fern, founded on the figure in Plukenet's Phytogr. t. 179. fig. 1, which is perhaps *P. phymatodes*, Linn., but cannot possibly be *P. coronans*, as the figure shows the rhizome and the foot of the stipe.

Subgenus IX. *Phymatodes*. Fronds undivided, simple lobed or pinnatifid, glabrous or nearly so. Veins copiously anastomosing, the free included veinlets spreading in all directions.

* Fronds simple, or sparingly or irregularly lobed, not regularly pinnatifid.

† Main veins not distinct to the edge.

41. *P. ROSTRATUM*, Hook. Sp. Fil. v. 66, 2nd Cent. Ferns, t. 53. Rhizome very slender, wide-creeping, with spreading lanceolate-linear scales; stipes distant, $\frac{1}{2}$ –2 in.; fronds lanceolate acuminate, somewhat dimorphic, the barren being broader; texture coriaceous, veins obscure; sori large, in two rows often the whole length of the frond.—Hk. & Baker, Syn. Fil. 353. *Pleopeltis rostrata*, Bedd. Ferns Brit. Ind. t. 159.

Sikkim and Bhotan, alt. 6000 feet, in many places and in large quantity. Khasia, alt. 4000–5000 feet, frequent.

42. *P. SUPERFICIALE*, Blume, Enum. Pl. Jav. Fil. 123, Fl. Jav. Fil. t. 56. fig. 1. Rhizome scandent, not very thick; scales ovate and lanceolate, some acute, none hair-pointed; stipes long, 1–4 in., sometimes with ovate scales; frond lanceolate-linear, coriaceous (but in some examples the veins are distinct); sori in many rows, scattered, large or small.—Hook. Sp. Fil. v. 71; Hk. & Baker, Syn. Fil. 355. *Pleopeltis superficialis*, Bedd. Ferns Brit. Ind. t. 75.

Khasia, alt. 4000–6000 feet, plentiful, extending to the Naga country east, and to Bhotan and Mishmee.—Distrib. South China, Malaya.

The Khasi fern figured by Beddome very accurately, starting from the ground, ascends the trunks of small trees and shrubs for several feet; the scales are adpressed to the rhizome, and the examples are all very constant to the type. In all this group of ferns, though the young fresh frond is coriaceous opaque, the frond in age (and sometimes through deficiency of nutriment in unhealthy growth) shows the venation with great distinctness.—*P. hymenodes*, Wall. Cat. 283, is reduced here by Sir W. J. Hooker, *l. c.*; but the identical sheet thereof on which he relied is *P. normale* type (mihi).

Var. *semilinearis*. Scales of the rhizome patent, more acute; fronds subsessile.

Bhotan, *Griffith*. Nepaul, *Wallich*.—A solitary but fine specimen; the scales and the subsessile fronds are more like those of *P. lineare*; but the sori are scattered in many rows. Wallich's example is mixed under his *P. longifrons*, Wall. Cat. 274.

43. *P. NORMALE*, Don, Prodr. Fl. Nep. 1. Rhizome scandent, not very thick, with ovate or lanceolate, sometimes almost hair-pointed adpressed scales, some of which carry erect from their backs tufts of linear stiff black-red bristles; frond narrowed much at the base, sometimes to the very foot of the stipe, usually broadest near the middle; a few scattered ovate close-adpressed scales often present on the stipe or near the base of the main rhachis beneath; sori often in several rows, or irregularly in one row or (rarely) regular in one row.—Mett. Farngatt. Polypod. 86, t. 1. figs. 41–43; Hook. Sp. Fil. v. 69; Hk. & Baker, Syn. Fil. 358. *P. longifrons*, Wall. Cat. 274, as to type sheet; Hk. & Grev. Ic. Fil. t. 65. *Pleopeltis normalis*, Bedd. Ferns Brit. Ind. t. 10?

Himalaya, alt. 4000–8000 feet; from Nepaul to Bhotan, frequent. Khasia, alt. 3000–5000 feet, frequent.—Distrib.?

I understand this species exactly as Mettenius did, and define it by the very peculiar bristles on the backs of the scales of the rhizome. Beddome's figure may be the true plant, but shows no scales at all. As in other species, the scales along the rhizome are usually subobtuse, while those near the extremities and the base of the stipes are acute.—The Kew Malaya material formerly placed here is named by Mettenius *P. chinense*.

44. *P. LINEARE*, Thunb. Fl. Jap. 335, Ic. Pl. Jap. t. 19. Rhizome creeping not very extensively, clothed with lax ovate or lanceolate, often nearly hair-pointed grey scales without bristles on their backs; fronds much longer than their stipes, lanceolate-linear, narrowed at the base, sometimes nearly to the foot of the stipe; sori large, in a single row midway between the main rhachis and margin.—Hk. & Baker, Syn. Fil. 354. *P. loriforme*, Wall. Cat. 271; Mett. Farngatt. Polypod. 92, t. 1. figs. 49, 50; Hook. Garden Ferns, t. 14, Sp. Fil. v. 57. *P. leiopteris*, Kunze; Mett. Fil. Hort. Lips. t. 25. figs. 37–39. *P. sesquipedale*, Wall. Cat. 275; Mett. Farngatt. Polypod. 91. *P. excavatum*, Willd. Sp. Pl. v. 158. *P. contiguum*, Wall. Cat. 285. *P. Wightianum*, Wall. Cat. 2222. *P. acutissimum*, Wall. Cat. 4727. *P. Greville-anum*, Wall. Cat. 5169. *P. gladiatum*, Wall. Cat. 279. *P. phlebodes*, Kunze; Mett. Farngatt. Polypod. 92. *P. atro-punctatum*, Gaud.; Hk. & Arn. Bot. Beech. Voy. 103. *Pleopeltis nuda*, Hook. Exot. Fl. t. 63; Hk. & Bauer, Gen. Fil. t. 18. *P. Wightiana*, Bedd. Ferns South. Ind. t. 180.

Himalaya, alt. 1000–10,000 feet; from Kashmir to Bhotan, very common. Khasia, alt. 500–6000 feet; very common.—Distrib. South India, Ceylon, Malay Peninsula and Islands, China, Japan, Southern and Central Africa, with the islands.

One of the most abundant of ferns in the Indian hills. The sori are, when young, mixed with scales shaped like tin-tacks, whence J. Smith makes it to be a gen. nov.

Lepisorus. The sori in age are often very large, deep sunk, finally splitting out of the frond altogether, whence the name *P. excavatum*. The fronds are usually very narrow, and the sori then get nearer the margin than the main rhachis; this is *P. loriforme*, Wall. When the fronds are picked in late autumn or winter, the venation is conspicuous; this is *P. phlebodes*, Kunze. None of these are more than trifling varieties; the following are more curious.

Var. 1. *steniste*. Fronds 11 by $\frac{1}{8}$ in.; sori large, appearing as projections on the margin.

Sikkim, alt. 10,000 feet.—The dimensions, 11 by $\frac{1}{8}$ in., are those of the narrowest example I have collected; it looks very distinct from *P. lineare*, but is connected by intermediates with *P. loriforme*, Wall. The species *P. stenophyllum*, Blume (*Pleopeltis*, Bedd. Ferns Brit. Ind. t. 234), must come in between my var. *steniste* and *P. lineare* type.

Var. 2. *polymorpha*. Barren fronds copiously pinnatifid; lobes ovate and linear, $\frac{1}{4}$ – $\frac{3}{4}$ in. deep, 10–15 on each margin of the frond.

Khasia, Nunklow, C. B. Clarke.

45. *P. CLATHRATUM*, C. B. Clarke. Rhizome short-creeping, with ovate acute, often hair-pointed scales; fronds small, stipe often as long as the frond; sori mixed with sessile irregularly peltate and lacerate clathrate scales.

Kashmir; Pir Pinjul, alt. 11,000–12,000 feet, C. B. Clarke. Khurum Valley, alt. 11,000 feet, Dr. Aitchison.

This may be an alpine var. of *P. lineare*; but the scales are peculiar, closely resembling those from the rhizome in *Euasplenium*, the veins being a rich black-chestnut colour. The texture is thin, the venation in the young healthy fronds much more conspicuous than in *P. lineare*, the stipes unusually long. (Pl. LXXXII. fig. 1.)

46. *P. ANGUSTATUM*, Swartz; Hook. Sp. Fil. 43. Fronds large, lanceolate-linear, coriaceous, densely stellate-tomentose beneath; sori ultimately oblong, mixed with stalked peltate fimbriate scales.—Schk. Krypt. Gew. t. 8, c; Hk. & Baker, Syn. Fil. 356. *P. sphærocephalum*, Wall. Cat. 272; Mett. Farngatt. Polypod. 122. *P. coriaceum*, Roxb. in Calc. Journ. Nat. Hist. iv. 481. *Niphobolus angustatus*, Hook. Garden Ferns, t. 20; Bedd. Ferns South. Ind. t. 185. *N. sphærocephalus*, Hk. & Grev. Ic. Fil. [t. 94. *N. macrocarpus*, Hk. & Arn. Bot. Beech. Voy. 74, t. 18.

South India, Malacca, Malaya, North Australia, Polynesia, South China.

Var. *depauperata*. Fronds 5 in., with scattered, sessile, peltate, fimbriate scales beneath, but no hairs; sori large, oblong, without stalked scales.

Assam, Jenkins.—The scrap on the faith of which *P. angustatum* is said to grow in North India was determined by Sir W. J. Hooker. The rhizome is wiry, far thinner than in *P. angustatum*; nor does it carry the characteristic scales of *P. angustatum*. There are on it two fronds, each 5 in. long, the fertile one $\frac{1}{2}$ in. broad, the barren one $\frac{1}{2}$ in.

The sori in size and position resemble those of *P. angustatum*. It is vain to found a new species on such material, and it is not improbable that it really is *P. angustatum* depauperated.

[*P. lanceolatum*, Linn., is said by Beddome (Ferns Brit. Ind. Suppl. p. 22) to be "general" in India; but I have no example from North India.]

†† *Main veins distinct to the edge or nearly to the edge.*

47. *P. RHYNCOPHYLLUM*, Hook. Sp. Fil. v. 65, 2nd Cent. Ferns, t. 54. Rhizome wiry, far-creeping, with lanceolate-subulate spreading yellow-brown scales; stipes long; fronds somewhat dimorphic, firm in texture; sori principally confined to the caudate prolongation of the fertile frond.—Hk. & Baker, Syn. Fil. 359. *Pleopeltis rhyncophylla*, Bedd. Ferns Brit. Ind. t. 9.

Khasia, alt. 4000–5500 feet, common.—Distrib. Burma.

48. *P. GRIFFITHIANUM*, Hook. Sp. Fil. v. 62, 2nd Cent. Ferns, t. 51. Rhizome not very thick, far-creeping, with lanceolate-subulate brown spreading scales; stipes long; fronds subuniform, firm in texture; sori large, in a single row close to the main rhachis, often extending more than halfway to the base of the frond.—Hk. & Baker, Syn. Fil. 359. *Pleopeltis Griffithiana*, Bedd. Ferns Brit. Ind. t. 158.

Sikkim and Bhotan, alt. 6000–9000 feet; common. Khasia, alt. 4000–5000 feet; frequent.

49. *P. OVATUM*, Wall. Cat. 276. Rhizome not very thick, far-creeping, with lanceolate-linear brown spreading scales; stipes long; fronds subuniform, herbaceous, broadly lanceolate; sori large, in single irregular rows between the main veins, usually few.—Hk. & Grev. Ic. Fil. t. 41; Hook. Sp. Fil. v. 64; Hk. & Baker, Syn. Fil. 359. *Pleopeltis ovata*, Bedd. Ferns Brit. Ind. t. 157.

Sikkim, *Sir J. D. Hooker*; Chundaghiri, *Wall.* Bhotan, *Griffith.* Khasia, alt. 4000 feet; in several places, but must be called rare. (Moosmai Cave; Bishop's Falls, Shillong.)—Distrib. China.

P. ensatum, Thunb., seems very near.

50. *P. MEMBRANACEUM*, Don, Prodr. Fl. Nep. 2. Rhizome stout, shortly creeping, with ovate-lanceolate scales; fronds large, lanceolate, thin, membranous, green, gradually narrowed at the base to a short stipe; primary parallel veins connected by secondary veins in several series parallel to the main rhachis; sori very many, rarely coalescent, on the anastomosing veinlets included in the areola between the secondary veins.—Mett. Farngatt. Polypod. 118; Hook. Sp. Fil. v. 70 (excl. syn. *P. heterocarpum*); Hk. & Baker, Syn. Fil. 360, partly. *P. grandifolium*, Wall. Cat. 282. (Pl. LXXXII. fig. 3.)

Himalaya, alt. 3000–8000 feet; from Gurwhal to Bhotan, very common. Khasia, alt. 2000–5000 feet, very common. Chota Nagpore, Parasnath, alt. 3000 feet, *C. B. Clarke*.—Distrib. South India, Ceylon.

The whole North-Indian material is very constant to Mettenius's type, the venation of which is carefully described by Sir W. J. Hooker: the sori tend to be 6 in each areola between the secondary veins. The Peninsula plant, well figured by Bedd. (Ferns South. Ind. t. 177), is much smaller and narrower than the North-Indian plant, and has the secondary veins much less distinct; but it may not be specifically separable.

51. *P. ZIPPELLII*, Blume, Fl. Jav. Fil. 172, t. 80. Rhizome slender, creeping shortly, with lanceolate acute scales; fronds linear-lanceolate, narrowed gradually at the base into a short stipe, coriaceous; lanceolate subobtuse scales often continued up the rhachis, and on the lower part of the rhachis beneath; secondary veins (between the primary parallel veins) obscure, but, so far as they can be distinguished, the sori are on them in two rows between the primary veins.—Mett. Farn. Polypod. 115; Hook. Sp. Fil. v. 72. *P. oxyphyllum*, Kunze, in Bot. Zeit. vi. 116. *P. heterocarpum*, Hk. & Baker, Syn. Fil. 360, not of Blume nor of Mett. *Pleopeltis heterocarpa*, Bedd. Ferns Brit. Ind. t. 319.

Sikkim and Bhotan, alt. 2000–6000 feet, common. Khasia, alt. 2000–4000 feet, frequent.—Distrib. Java, Philippines, Ceylon.

P. heterocarpum, Blume, Fl. Jav. Fil. t. 75, is *P. hemionitideum*, Wall., as is apparent at a glance from the sudden contraction of the frond at the base into a narrowly winged stipe: besides this, the more open venation, the confluent sori, the thick rhizome, all prove it to be *P. hemionitideum*. Blume's figure of *P. Zippellii* shows very accurately the venation of the Himalayan plant. As regards the Chinese examples, with the sori in many rows between the primary veins, referred to *P. Zippellii* at Kew, I do not think they belong.

52. *P. PUNCTATUM*, Swartz, in Schrad. Journ. 1800, ii. 21, not of Syn. Fil. 41, nor of Thunb. Rhizome stout, short-creeping, with lanceolate scales; fronds linear, narrowed at the base gradually; stipe short or none; texture coriaceous, veins obscure; sori very many, scattered closely over nearly the whole lower surface.—*P. irioides*, Lamk. Encycl. v. 513; Blume, Fl. Jav. Fil. 169, t. 77; Hk. & Grev. Ic. Fil. t. 125; Mett. Fil. Hort. Lips. 38, t. 20. fig. 10; Hook. Sp. Fil. v. 67, Fil. Exot. t. 4; Hk. & Baker, Syn. Fil. 360; Benth. Fl. Austral. vii. 771. *P. glabrum*, Roxb.; Wall. Cat. 281; in Calc. Journ. Nat. Hist. iv. 482, t. 28. *P. polycephalum*, Wall. Cat. 273. *Aspidium microcarpon*, Blume, Enum. Pl. Jav. Fil. 142. *Microsorium irregulare*, Link; Fée, Gen. Fil. t. 20 B. fig. 3. *Phymatodes polycarpa*, Presl, Tent. Pterid. 198, t. 8. fig. 19. *Pleopeltis irioides*, Carr. in Fl. Viti. 367; Bedd. Ferns South. Ind. t. 178. *P. punctata*, Bedd. Ferns Brit. Ind. Suppl. p. 22. *Acrostichum punctatum*, Linn. Sp. Pl. 1524.

Bengal Plain, abundant; from the sea-face of the Soonderbun; extending but little way up the mountains, rarely at 2000–3000 feet alt.—Distrib. South India, Ceylon, Burma, Malaya, China, North Australia, Polynesia, Southern and Central Africa with the islands to the Guinea coast.

53. *P. HEMIONITIDEUM*, Wall. Cat. 284. Rhizome creeping shortly, with lanceolate

spreading scales; frond linear-lanceolate, decurrent at base on the winged stipe; texture membranous, veins prominent, areolation much less close than in *P. Zippellii*; sori (nearly always some of them) confluent into oblong large patches in ripe fruit.—Mett. Farngatt. Polypod. 112; Hook. Sp. Fil. v. 73; Hk. & Baker, Syn. Fil. 360. *P. heterocarpum*, Blume, Fl. Jav. Fil. 167, t. 75, not of Baker. *P. Zollingerianum*, Kunze; Mett. Farngatt. Polypod. 118, t. 3. fig. 51. *Selliginea hemionitidea*, Presl, Tent. Pterid. t. 9. fig. 17. *Pleopeltis hemionitidea*, Bedd. Ferns South. Ind. t. 182.

Himalaya, alt. 2000–7000 feet; from Nepaul to Bhotan, very common. Khasia, alt. 2000–5000 feet, common. Chittagong Hills, alt. 1000 feet, *C. B. Clarke*.—Distrib. South India, Malaya, China.

This fern is often (but by no means always) spathulate, being suddenly narrowed into a long winged stipe. It is easily known from *P. Zippellii* (with which the synonymy has been mixed) by the prominent secondary venation and the confluent sori. The rhizome is usually (but not always) stouter.

54. *P. PTEROPUS*, Blume, Fl. Jav. Fil. 168, t. 76. Rhizome slender, creeping; stipe and main rhachis beneath pubescent-squamose; frond often deeply divided into 3 narrow lanceolate lobes; simple and forked fronds are also frequent, 4–5-lobed fronds rare; texture herbaceous; sori small, scattered irregularly.—Mett. Farngatt. Polypod. 104, t. 1. figs. 36, 37; Hk. & Baker, Syn. Fil. 362. *P. tridactylon*, Wall. Cat. 315; Hk. & Grev. Ic. Fil. t. 209; Mett. Farngatt. Polypod. 104, t. 1. figs. 39, 40; Hook. Sp. Fil. v. 75. *Pleopeltis tridactyla*, Bedd. Ferns Brit. Ind. t. 11, Ferns South. Ind. t. 179.

Sikkim and Bhotan, alt. 1000–4000 feet; common. Khasia; alt. 0–4000 feet, common; extending into the plains in Mymensingh. Chittagong, alt. 0–1000 feet, common.—Distrib. South India, Ceylon, Burma, Malaya, South China.

In wet sand by running streams. In the upper levels it is often small, with fronds mostly simple as figured by Beddome (Ferns South. Ind. t. 179). In the plains it is much larger, my Chittagong plants being larger even than Blume's picture. The Java specimens are more glabrous and firmer in texture than the Indian examples, which are very green, and often minutely pubescent.

** *Fronds deeply pinnatifid; but those from weak rhizomes are in several species occasionally trifid, in P. hastatum and ebenipes sometimes simple. (Sori large, in a single row on each side the rhachis of the lobes in all the Indian species except P. dilatatum.)*

55. *P. HASTATUM*, Thunb. Fl. Jap. 335, Ic. Fl. Jap. iii. t. 10. Rhizome stout, covered with spreading lanceolate-linear yellow or reddish scales, creeping not widely; stipes long, glabrous, as is the base of the main rhachis beneath; frond narrowed to the stipe, glabrous, firm in texture, margin entire.—Kunze, Farnkr. Schk. Suppl. t. 83; Mett. Farngatt. Polypod. 106, t. 1. fig. 18; Hook. Sp. Fil. v. 74; Hk. & Baker, Syn. Fil. 361.

Var. 1. *Thunbergii*. Fronds small, trilobate and simple.

Sikkim and Bhotan, alt. 7000–10,000 feet, frequent. Khasia, alt. 5000–6000 feet, frequent.—Distrib. China, Japan.

Some of my Darjeeling fronds, including the stipes, are $1\frac{1}{4}$ in. long, entire, in full fruit; others are exactly *P. trifidum*, Don, Prodr. Fl. Nep. 3: they are fronds from young rhizomes of the next variety.

Var. 2. *oxyloba*, (sp.) Wall. Cat. 294. Fronds pinnatifid, often attaining 15 in.—Mett. Farngatt. Polypod. 106; Hook. Sp. Fil. 77. *P. trifidum*, Hk. & Baker, Syn. Fil. 363. *P. propinquum*, Wall. Cat. 293, partly. *Pleopeltis oxyloba* and *malacodon*, Bedd. Ferns South. Ind. tt. 175, 387.

Himalaya; from Gurwhal to Bhotan, alt. 3000–8000 feet, common. Khasia, alt. 2000–6000 feet; common.—Distrib. South India, Ceylon.

This fern is known easily from the succeeding allied species by its entire edge, which is not even minutely serrulate. The rhizome also is shorter and thicker than that of *P. ebenipes*. The secondary venation is generally obscure, but in autumn- and winter-gathered examples often conspicuous: such have been marked *P. Dodgsoni*, ? nov. sp., in Kew Herb.

56. *P. CYRTOLOBUM*, J. Smith. Rhizome rather slender, creeping somewhat extensively, often glaucous; scales peltately adfixed, with a scarious brown margin and prolonged lanceolate spreading black point; stipe long, glabrous, base of the main rhachis beneath often with a few soft scales; frond 6–15 in., lanceolate, narrowed into the stipe, the pinnæ all much drawn upwards, so that the frond is narrow, the last lobe exceedingly long; margin minutely serrate, the teeth not mucronate.—*Pleopeltis Stewartii*, Hk. & Baker, Syn. Fil. 2nd ed. 513, not of Bedd. (Pl. LXXXIII.)

Nepaul to Bhotan, alt. 9000–12,000 feet, very common.

A very uniform species, pendent from trees, whence the fronds have a peculiarly tapering appearance. Wallich collected it, and marked it “an *P. propinqui*, var.?”

57. *P. STEWARTII*, C. B. Clarke. Rhizome rather slender, creeping somewhat extensively; scales lax, soft, lanceolate-linear, almost hair-pointed, yellow-brown; stipe and main rhachis beneath glabrous; lowest pinnæ deflexed, somewhat broad at the base; margin minutely serrulate, teeth not mucronate.—*Pleopeltis Stewartii*, Bedd. Ferns Brit. Ind. t. 204, not of Baker.

Gurwhal, *Stewart* (fide Bedd.); Pathankori, alt. 10,500 feet, *Strachey & Winterbottom*. Sikkim, alt. 12,000–13,000 feet; Lachen, *Sir J. D. Hooker*.

In venation, sori, texture, margin, and outline this fern closely resembles *P. ebenipes*, and I had always supposed it a var. of *P. ebenipes*, and that *P. cyrtolobum* (which I have collected so largely) was *P. Stewartii*. Apart from the scales of the rhizome and its glabrousness, the present fern (*Stewartii*, Bedd.) differs considerably from *P. cyrtolobum* in its very divaricate lobes spreading straight stellately in every direction; whereas in *P. cyrtolobum* the lobes are curved, all much bending upwards. Strachey and Winter-

bottom, however, marked their specimens *Phymatodes cyrtolobum*, J. Smith, and Baker. Nor do I feel sure *P. Stewartii* may be not the erect form of *P. cyrtolobum*. But contra, my very large collection of *P.* that tends towards *P. Stewartii* in any point; and, secondly, if *P. Stewartii* is to be reduced to a var., it seems to me nearer *P. ebenipes*, or even nearer *P. hastatum*, than to *P. cyrtolobum*.

58. *P. MALACODON*, Hook. Sp. Fil. v. 87, excl. β . Rhizome rather slender, somewhat extensively creeping; scales lax, lanceolate-linear, brown-black; frond often subcordate at base; margin acutely serrulate; teeth mucronate, often spinescent.—Hk. & Baker, Syn. Fil. 363 (excl. syn. *P. cyrtolobum*). Not *Pleopeltis malacodon*, Bedd. Ferns Brit. Ind. t. 387.

Nepaul to Bhotan, alt. 10,000–13,000 feet; very common, C. B. Clarke.

A very common fern, known at once by its strongly serrate margin. It is remarkable that I find no example in the Kew Herbarium (other than my own), except some pieces mixed on a sheet of T. Thomson's, said to have been collected "Top of Hattu, alt. 10,500 feet, in the North-west Himalaya."

59. *P. EBENIPES*, Hook. Sp. Fil. v. 88. Rhizome somewhat widely creeping, stout, with adpressed lanceolate black scales, similar scales often present on the main rhachis beneath; margin minutely serrulate, teeth not mucronate.—Hk. & Baker, Syn. Fil. 365. *P. melanopus*, R. Br. in Wall. Cat. 293, partly. *Pleopeltis ebenipes*, Bedd. Ferns Brit. Ind. t. 138.

From Gurwhal to Bhotan, alt. 6000–11,000 feet; very common.

The scales on the rhizome often have rusty almost yellowish tips; the fern is, however, then (as are scraps without rhizome) easily sorted from *P. hastatum* (*oxylobum*); by the serrulate margin. The real difficulty is to separate it from *P. Stewartii*, Bedd., which I think can hardly be done in the absence of the rhizome.—I have collected plants of this from young rhizomes with simple entire fronds.

Var. β . *Oakesii*. Large; pinnæ 5 by $\frac{1}{2}$ in., caudate; rhachises above hairy.

Darjeeling, alt. 7000 feet; Dr. Jerdon, C. B. Clarke.—As this fern grows in Darjeeling station I have often observed it, and doubted whether it was worthy specific rank. The pinnæ are cut down very nearly indeed to the main rhachis, as many as 15 on each side, and very unlike the common outline of *P. ebenipes*; but the rhizome and scales are typical *ebenipes*.

Var. γ . *Parishii*. Texture thin, margin crenate.—*Pleopeltis Parishii*, Bedd. Ferns Brit. Ind. t. 125.

Khasia, Dr. Jerdon.—Distrib. Moulmein (fide Beddome).—I identify Dr. Jerdon's plant as = Beddome's sp. *P. Parishii* from Beddome's picture only. Dr. Jerdon's plant has some ovate black-chestnut deciduous scales about the base of the main rhachis beneath; and though the rhizome is wanting in my example I have no doubt that it is *P. ebenipes*, var., whatever Col. Beddome's may have been.

60. *P. macrocarpum*, Mett. ; Kunze, in *Linnæa*, xxxvi. 125. Rhizome slender, wide-creeeping, clothed with lanceolate-linear not hair-pointed scales; main rhachis and frond beneath more or less pubescent; pinnae oblong, obtuse, the lowest generally (not always) free; costal arches of the pinnae obscure.—Hk. & Baker, *Syn. Fil.* 2nd ed. 511. *P. Atkinsoni*, C. B. Clarke, MS. *Goniophlebium erythrocarpum*, Bedd. Ferns Brit. Ind. p. 21, t. 382.

Sikkim; Lachen, alt. 9000–11,000 feet, *Sir J. D. Hooker*; Yakia Valley, alt. 9000 feet, *C. B. Clarke*.

61. *P. LONGISSIMUM*, Blume, Enum. Pl. Jav. Fil. 127. Frond elongate, with 8–20 narrow pinnae on each side; margin entire; sori impressed, projecting through the upper surface.—Blume, Fl. Jav. Fil. 159, t. 68; Mett. Fil. Hort. Lips. t. 25. fig. 18, Farngatt. Polypod. 102, partly; Hook. Sp. Fil. v. 80, Fil. Exot. t. 22. *P. excavatum*, Roxb. in Calc. Journ. Nat. Hist. iv. 485. *P. alternifolium*, Wall. Cat. 289, var. *polyphylla*, Wall. *Pleopeltis longissima*, Bedd. Ferns Brit. Ind. t. 388.

Assam, Gowhatty; *Simons*. Sylhet, *Wallich*. Furidpore, *C. B. Clarke*.—Distrib. Malaya, Formosa, Admiralty Islands.

My examples were floating in jheels, and the other Bengal examples that have rhizomes were aquatic. Rhizome long, covered with lax ovate-lanceolate grey-slaty scarious scales. Pinnae $\frac{1}{2}$ – $\frac{3}{4}$ in. broad.

62. *P. NIGRESCENS*, Blume, Enum. Pl. Jav. Fil. 126. Pinnae 4–8 on each side the main rhachis, broader than in *P. longissimum*, otherwise resembling it.—Blume, Fl. Jav. Fil. 161, t. 70; Hook. Sp. Fil. v. 81; Hk. & Baker, *Syn. Fil.* 364; Benth. Fl. Austral. vii. 769. *P. longissimum*, Mett. Farngatt. Polypod. 102, partly. *P. alternifolium*, Wall. Cat. 289, type. *Pleopeltis longissima*, Bedd. Ferns South. Ind. t. 176. *P. nigrescens*, Carr. in Fl. Viti. 368; Bedd. Ferns Brit. Ind. Suppl. p. 23.

Sylhet, *Wallich*.—Distrib. Ceylon, Malay Peninsula and Islands, Polynesia.

Cultivators find this fern easily distinguishable from the preceding, but Mettenius thought it not distinct. Beddome remarks that there is no difference, except that the pinnae of *P. nigrescens* are fewer and broader. The rhizome and sori are closely alike and peculiar; the venation is the same, except that in the broader pinnae there is room for more rows of looped veins outside the sori.—Lastly, whether it be held a form or a species, I greatly doubt its being native in North India. The only example is one sheet of Wallich's Cat. No. 289. It is clear that before issuing his No. 289, Wallich mixed his *P. longissimum* from Sylhet with his *P. nigrescens* from Malacca, and issued all as *P. alternifolium*, Wall. No one else can find *P. nigrescens* in Bengal.—In Wallich's own set, I find that the *P. longissimum* is marked from Sylhet, the *P. nigrescens* from Singapore: I have little doubt that this is correct.

63. *P. DILATATUM*, Wall. Cat. 295. Rhizome stout, somewhat widely creeping, clothed with ovate-lanceolate lax scarious grey-slaty scales; frond large, with many close

pinnæ decurrent on the stipe, sometimes nearly to its foot; sori many, small, scattered in several rows between the main veins of the lobes.—Hook. Sp. Fil. v. 85; Hk. & Baker, Syn. Fil. 365. *Pleopeltis dilatata*, Bedd. Ferns Brit. Ind. t. 122.

From Nepaul to Bhotan, alt. 3000–8000 feet; common. Khasia; alt. 2000–8000 feet, common.—Distrib. Malacca, Samoa.

Subgenus X. *Pleopeltis*. Fronds completely 1-pinnate, the lowest pinnæ standing apart. Veins copiously anastomosing, the free included veinlets spreading in all directions.

64. *P. JUGLANDIFOLIUM*, Don, Prodr. Fl. Nep. 3. Rhizome stout, creeping, with many spreading lanceolate-subulate yellow-brown scales; main veins of the pinnæ parallel, prominent, with one sorus between each pair.—Hk. & Baker, Syn. Fil. 368. *P. capitellatum*, Wall. Cat. 306; Mett. Farngatt. Polypod. 109; Hook. Sp. Fil. v. 90. *P. leiorhizon*, Wall. Cat. 303, partly. *P. tenuicauda*, Hook. Sp. Fil. v. 90. *Pleopeltis capitellata*, Bedd. Ferns Brit. Ind. t. 12. *P. Moulmeinsis*, Bedd. Ferns Brit. Ind. t. 205.

Himalaya, alt. 2000–9000 feet; from Gurwhal to Bhotan, very common. Khasia, alt. 2000–5000 feet, very common.—Distrib. Moulmein.

Pinnæ sometimes irregularly pinnatifid into round lobes.

Var. *biserialis*. One sorus or frequently two sori between each pair of parallel main veins of the pinnæ.

Khasia, *Simons*; alt. 4000 feet near Nunklow, several times collected; *C. B. Clarke*.—This has been referred to *P. himalayense*, Hook., but has a very stout rhizome.

65. *P. LEHMANNI*, Mett. Farngatt. Polypod. 117. Rhizome not very stout, wide-creeping, with lanceolate, hair-pointed, spreading scales, yellow or whitish; pinnæ linear-oblong, not much narrowed at the base, glabrous beneath, the margin obscurely (or not at all) hyaline; sori between the main veins of the pinnæ in 2–3–4 rows.—Hk. & Baker, Syn. Fil. 369. *Pleopeltis Lehmanni*, Bedd. Ferns Brit. Ind. t. 260.

Sikkim, alt. 4000–8000 feet; common.—Distrib. Burma.

66. *P. VENUSTUM*, Wall. Cat. 305. Rhizome glaucous, not very stout, wide-creeping, with lanceolate hair-pointed spreading rufous scales; pinnæ lanceolate-caudate, usually much broader in the middle than at the very base, minutely rufous, pubescent beneath, margin conspicuously hyaline; sori between the main veins of the pinnæ in 1–2–3 rows.—*P. himalayense*, Hook. Sp. Fil. v. 91; Hk. & Baker, Syn. Fil. 369. *Pleopeltis himalayensis*, Bedd. Ferns Brit. Ind. t. 318.

Himalaya, alt. 6000–10,000 feet; from Nepaul to Bhotan, common.

Considered not distinct from *P. Lehmanni* by Mettenius, and it can hardly be distinguished but by the prominently hyaline margin and surface beneath pubescent (Major Henderson).

Var. aspidioides. Surface beneath densely brown tomentose, the sori beneath in the tomentum.

Bhotan, *Griffith*.—But there is a series of examples connecting this var. with the type.—As to the name of this species, I cannot find where *P. venustum*, Desv., was described; it has, at all events, so completely slipped out of sight that it no way interferes with *P. venustum*, Wall.

67. *P. LEIORHIZON*, Wall. Cat. 303, chiefly. Rhizome creeping shortly, with lax slaty-brown, ovate, not acute scales; pinnæ narrow, lanceolate-linear, coriaceous; primary parallel veins hardly more prominent than the secondary venation, with one sorus between each pair of such parallel obscure veins.—Mett. Fil. Hort. Lips. 37, t. 25. fig. 17; Farngatt. Polypod. 103; Hook. Fil. Exot. t. 25, Sp. Fil. v. 92; Hk. & Baker, Syn. Fil. 369. *P. lucidum*, Roxb. in Calc. Journ. Nat. Hist. iv. 486. *Pleopeltis leiorhizon*, Bedd. Ferns South. Ind. t. 174.

North India, alt. 0–4000 feet, very common in the lower hills, extending west to Nepaul.—Distrib. South India.

33. NOTHOLÆNA, R. Br.

1. *N. MARANTÆ*, R. Br. Prodr. Fl. Nov. Holl. 145. *Nothochlæna Marantæ*, Hook. Sp. Fil. v. 120; Bedd. Ferns Brit. Ind. t. 1; Hk. & Baker, Syn. Fil. v. 120. *Acrostichum Marantæ*, Linn. Sp. Pl. 1527; Schk. Krypt. Gew. t. 4; Sibth. Fl. Græc. t. 964. *Gymnogramme Marantæ*, Mett.; Milde, Fil. Europ. 21.

Alpine Himalaya, from Kashmir to Kumaon; rare. Sikkim, alt. 9000–15,000 feet, Lachen Valley, *Sir J. D. Hooker*.—Distrib. South Europe and the Mediterranean Region from Macaronesia to the Caucasus and Abyssinia.

The scales on the back of the fronds may be called “pseudo-wool” (λῆνος); I do not see how the fern can be said to have a “pseudo-indumentum;” it has a real indumentum. Rob. Brown called it *Notholæna*; and I am convinced that he meant *Notholæna*, and that Desveaux blundered.

34. GYMNOGRAMME, Desv.

Series I. Veins free.

Subgenus I. *Leptogramme*. Sori oblong, not forked.

1. *G. TOTTA*, Schlecht. Adumbr. 15, t. 6. Rhizome shortly creeping; stipe and frond on both surfaces pilose; frond 1-pinnate; pinnæ pinnatifid about halfway to the midrib; veins in the lobes simple.—Blume, Fl. Jav. Fil. 90, t. 38; Hook. Sp. Fil. v. 138; Hk. & Baker, Syn. Fil. 376. *G. aspidioides*, Blume, Enum. Pl. Jav. Fil. 112. *G. Loveii*, Hk. & Grev. Ic. Fil. t. 89. *Polypodium Tottum*, Willd. Sp. Pl. v. 201. *Grammitis Totta*, Presl; Hk. & Bauer, Gen. Fil. t. 72 B; Bedd. Ferns South. Ind. t. 49. *Phegopteris Totta*, Mett. Farngatt. Pheg. & Asp. 19; Milde, Fil. Europ. 101.

North-west Himalaya, Kashmir to Kumaon, alt. 6000 feet, rare. Khasia; alt. 3000—

5000 feet, common.—Distrib. South India, Ceylon, Java, China, Japan; Africa (almost the whole) with its islands.

2. *G. AURITA*, Hook. Sp. Fil. v. 141, 2nd Cent. Ferns, tt. 74, 89. Rhizome extensively creeping; base of the stipe curved; with deflexed ovate-acute scales; frond 1-pinnate; pinnæ pinnatifid nearly to the midrib; veins in the lobes many of them forked.—Hk. & Baker, Syn. Fil. 377. *Grammitis aurita*, Bedd. Ferns Brit. Ind. t. 152.

Sikkim and Bhotan, alt. 3000–6000 feet; common. Assam and Khasia, alt. 2000–5000 feet, very common.

Beddome (Ferns Brit. Ind. Suppl. p. 24) doubts if this is more than a form of *Polypodium dilatans*: the rhizome is very different, and is constantly accompanied by a difference in the sori. The fern is glabrous beneath, or the rachises glandular-puberulous or subpubescent.

Var. *Levingii*. Frond weak; pinnæ not auriculate; lobes broadly oblong (not ovate), pilose on both surfaces; sori marginal.

Kashmir, Jhelum, and Chittapani Valleys, alt. 4000–7000 feet; *H. C. Levinge*.—This has the texture and hairiness of *G. Totta*, but the rhizome and venation of *G. aurita*; while the cutting is deeper than that of *C. Totta*, less auriculate than that of *G. aurita*.

3. *G. OPACA*, Spreng. Syst. Veg. iv. 39. Stipes tufted, with ovate-acute scales near the foot; frond 2-pinnate, texture thin, succulent, drying very black, margin crenate, scarcely serrate; lowest pinnæ little shorter than those above.—Bedd. Ferns Brit. Ind. t. 238; Hk. & Baker, Syn. Fil. 378. *G. obtusata*, Blume, Enum. Pl. Jav. Fil. 113, Fl. Jav. Fil. 97, t. 43; Hook. Sp. Fil. v. 143. *Phegopteris opaca*, Mett. Farngett. Pheg. & Asp. 15. *Hemionitis opaca*, Don, Prodr. Fl. Nep. 13.

From Nepaul to Bhotan, alt. 4000–7000 feet; frequent. Khasia, alt. 3000–5000 feet; common.—Distrib. Java.

G. arborescens, De Vriese, reduced here by Sir W. J. Hooker, does not perhaps belong: the examples are firm stout green, with an acutely toothed margin.

Subgenus II. *Syngramme*. Sori elongate, often forked or confluent.

4. *G. VESTITA*, Hook. Sp. Fil. v. 143, Ic. Pl. t. 115. Frond linear, 1-pinnate; pinnæ ovate, stalked, entire, densely rufous-villous beneath.—Hk. & Baker, Syn. Fil. 379. *Grammitis? vestita*, Wall. Cat. 12. *Syngramma vestita*, Bedd. Ferns Brit. Ind. t. 154.

From Chumba to Nepaul; alt. 6000–9000 feet, common. Bhotan; *Griffith*.—Distrib. South and North China.

5. *G. ANDERSONI*, Bedd. Ferns Brit. Ind. t. 190. Frond 1-pinnate; pinnæ crenately

lobed, densely clothed beneath with soft golden hair.—Hk. & Baker, Syn. Fil. 380.

Kamson, T. Anderson.

Nothing is known about this at Kew but the figure and description of Beddome.

6. *G. MAXIMA*, Bedd. Ferns Brit. Ind. Suppl. p. 24. Frond large, glabrous, or very nearly so, 1-2-pinnate; ultimate pinnæ large, stalked, linear-lanceolate-acuminate, entire or minutely serrulate.—*G. javanica*, Blume, Enum. Pl. Jav. Fil. 112, Fl. Jav. Fil. 95, t. 41; Hook. Sp. Fil. v. 145; Bedd. Ferns Brit. Ind. t. 57, Ferns South Ind. t. 232; Hk. & Baker, Syn. Fil. 382. *G. serrulata*, Blume, Enum. Pl. Jav. Fil. 113, Fl. Jav. Fil. 96, t. 42. *Diplasium fraxineum* and *falcatum*, Don, Prodr. Fl. Nep. 12, 13. *Grammitis procera*, Wall. Cat. 3. *G. caudata*, Wall. Cat. 4. *G. affinis*, Wall. Cat. 11.

Himalaya, from Chumba to Bhotan; alt. 1000-8000 feet, very common. Khasia, alt. 1000-5000 feet; common.—Distrib. Ceylon, Malaya, Japan, Polynesia, Tropical Africa.

Var. *pilosa*, (sp.) Brack. U. S. Explor. Ferns, 22, t. 4. Pubescent beneath.

Sikkim, alt. 6000 feet, C. B. Clarke.—Distrib. Sandwich Isles.

7. *G. MICROPHYLLA*, Hook. Sp. Fil. v. 129, 2nd Cent. Ferns, t. 16. Fronds tufted, 2-4 in. high, delicately green, 3-4-pinnatifid; ultimate segments $\frac{1}{2}$ - $\frac{1}{4}$ in., obovate-oblong.—Hk. & Baker, Syn. Fil. 383. *Grammitis microphylla*, Bedd. Ferns Brit. Ind. t. 148.

Khasia; Surareen, alt. 5000 feet, Griffith. Sikkim; Tonglo, alt. 7000-10,000 feet, Sir J. D. Hooker, H. C. Levinge, Col. Oakes; Sinchul, alt. 8000 feet, Gamble; Dikeeling, alt. 7500 feet, C. B. Clarke.

Series II. Veins inarching.

Subgenus III. *Stegnogramme*. Stipes continuous with the rhizome. Frond 1-pinnate.

8. *G. ASPIDIODES*, Hk. & Bauer, Gen. Fil. t. 120 B. Rhachises beneath pilose; pinnæ pinnatifid $\frac{1}{3}$ - $\frac{1}{4}$ the way to the midrib, 2 pairs of veinlets uniting; sori curved.—Hook. Sp. Fil. v. 150, 2nd Cent. Ferns, t. 50; Hk. & Baker, Syn. Fil. 378. *G. stegnogramme*, Blume, Fl. Jav. Fil. 98, t. 44. *Stegnogramme aspidioides*, Blume, Enum. Pl. Jav. Fil. 173; Presl, Tent. Pter. t. 9. fig. 5; Bedd. Ferns Brit. Ind. t. 149. *Phegopteris stegnogramme*, Mett. Farngatt. Pheg. & Asp. 26.

Khasia; alt. 4000-6000 feet, Griffith, Hook. f. & T. Thoms.—Distrib. Ceylon, Java.

The Java examples have the hairs denser, needle-like, the pinnæ less lobed, with 3-6 pairs of veinlets uniting, the sori straight, hence much shorter than in the Khasi plant, wherein the veinlets curve much upwards to the sinus. It is this last character that makes the Khasi possibly a distinct species from the Javan; but much more material is required from both localities to found a species on such a character.—De Vriese and Teijsmann, No. 612, referred here by Sir W. J. Hooker, has the frond narrowed below into auricles, and is *Polypodium auriculatum*, Wall. (vel prox.).

Subgenus IV. *Selliguea*. Stipes articulated on the rhizome. Fronds undivided or scarcely 1-pinnate.

9. *G. LANCEOLATA*, Hook. Sp. Fil. v. 156. Rhizome creeping, not very stout; frond $\frac{1}{2}$ – $\frac{3}{4}$ in. wide, simple, linear, entire, coriaceous, all the veins obscure; sori often nearly parallel with the main rhachis.—Hk. & Baker, Syn. Fil. 387. *Grammitis lanceolata*, Swartz, Syn. Fil. 22, 212, t. 1. fig. 4; Blume, Enum. Pl. Jav. Fil. 117; Hk. & Grev. Ic. Fil. t. 43. *Antrophyum lanceolatum*, Blume, Fl. Jav. Fil. 84, t. 36. *Loxogramme lanceolata*, Presl; Hk. & Bauer, Gen. Fil. t. 73 n; Bedd. Ferns South. Ind. t. 51. *Polypodium Loxogramme*, Mett. Farngatt. Polypod. 112, t. 3. fig. 25. *Selliguea lanceolata*, Carr. in Fl. Viti. 371.

Khasia, alt. 4000–5000 feet, frequent.—Distrib. South India, Ceylon, Malaya, China, Japan, Africa with its eastern islands.

10. *G. INVOLUTA*, Hook. Sp. Fil. v. 155. Rhizome stout, shortly creeping; frond $\frac{1}{2}$ – $2\frac{1}{2}$ in. wide, simple, linear, entire, coriaceous, all the veins obscure; sori usually oblique to the main rhachis.—Hk. & Baker, Syn. Fil. 387. *Grammitis involuta*, Don, Prodr. Fl. Nep. 14; Hk. & Grev. Ic. Fil. t. 53; Blume, Enum. Pl. Jav. Fil. 87. *G. cuspidata*, Zenk. Pl. Ind. i. t. 2. *G. scolopendrina*, Bory in Voy. Coq. t. 30. fig. 1. *G. flavescens*, Wall. Cat. 6. *G. acuminata*, Wall. Cat. 7. *G. macrophylla*, Wall. Cat. 10. *Antrophyum involutum*, Blume, Fl. Jav. Fil. 87. *A. coriaceum*, Blume, Fl. Jav. Fil. t. 37. fig. 1. *Loxogramme involuta*, Presl; Bedd. Ferns South. Ind. t. 50. *Polypodium involutum*, Mett. Fil. Hort. Lips. 37, t. 25. figs. 26, 27. *P. Blumei*, Mett. Farngatt. Polypod. 113, t. 3. fig. 27. *Selliguea Wallichiana*, Hook. Ic. Pl. t. 204.

Himalaya, alt. 2000–7000 feet; from Gurwhal to Bhotan, very common. Khasia, alt. 1000–5000 feet, very common.—Distrib. South India, Ceylon, Malaya, Polynesia.

I do not know how this fern differs from *G. lanceolata*, except by its larger size; the scales on the rhizome, the venation, and the texture are (so far as I can make out) exactly the same.

11. *G. HAMILTONIANA*, Hook. Sp. Fil. v. 160. Rhizome creeping; fronds linear, simple, with conspicuous venation, the fertile smaller on much longer stipes.—Hk. & Baker, Syn. Fil. 389. *Grammitis Hamiltoniana*, Wall. Cat. 9. *Ceterach pedunculata*, Hk. & Grev. Ic. Fil. t. 5. *Selliguea Hamiltoni*, Presl, Tent. Pterid. 216, t. 9. fig. 16; Bedd. Ferns Brit. Ind. t. 239. *Polypodium pedunculatum*, Mett. in Herb.

North and East Bengal, alt. 0–4000 feet; from Nepaul to Mishmee and Chittagong, common; extending also some way into the plain, as at Chattuck, C. B. Clarke.—Distrib. Yunan.

12. *G. ELLIPTICA*, Hk. & Baker, Syn. Fil. 389. Rhizome creeping; fronds deeply pinnatifid (sometimes 1-pinnate) or deeply 3–5-lobed; main veins of the lobes distinct.—*G. decurrens*, Hook. Sp. Fil. v. 161; Benth. Fl. Hongk. 457. *Polypodium ellipti-*

Fr. Jav. 231; Mq. in Ann. Mus. Légi. Bot. 2. 225. P. polifolium, Mett. Enumer. Polypod. 103, t. 2. figs. 21-24. Hemiozella polifolia, Don, Ponds. Fl. Nep. 13. Grammitis decurrens, Wall. Cat. 5. G. Polynesiensis, Wall. Cat. 775. Selligiea decurrens, Presl; Bedd. Ferns Brit. Ind. t. 139.

From Nepal to Bhutan and Khasia, alt. 2000-5000 feet, very common.—Distrib. Burma, China, Philippines, Japan.

Very variable in development; large specimens are 1-pinnate, with the pinnae $11\frac{1}{2}$ by $\frac{3}{4}$ in.; other specimens are subpalmately divided into 3-5 short lobes; and I have an example (in full fruit) quite simple. I believe it is all one.—The Hongkong example is dimorphic; the fertile frond reduced, with narrow pinnae.

35. BRAINEA, Hook.

1. *B. INSIGNIS*, Hook. Kew Gard. Misc. ix. 354, Sp. Fil. v. 162; Benth. Fl. Hongk. 460; Bedd. Ferns Brit. Ind. t. 139; Hk. & Baker, Syn. Fil. 390; Kurz, For. Fl. Brit. Burma, ii. 574. *Boweringia insignis*, Hook. Kew Gard. Misc. v. 237, t. 2, Fil. Exot. t. 38.

Khasia, alt. 3000-4000 feet; Pomrang, *Hook. f. & T. Thoms*; Jainka, *Col. Godwin-Austen*.—Distrib. Hongkong.

36. MENISCIUM, Schreb.

1. *M. TRIPHYLLUM*, Swartz, Syn. Fil. 19, 206. Rhizome creeping, with chestnut lanceolate-linear scales at the extremities; frond with 1-9 pinnae; pinnae narrowed at the base, villose beneath; secondary venation not prominent.—Wall. Cat. 61; Hk. & Grev. Ic. Fil. t. 120; Kunze, Farnkr. Schk. Suppl. t. 52; Bedd. Ferns South. Ind. t. 56; Hk. & Baker, Syn. Fil. 391. *M. erosum*, Wall. Cat. 62. *M. Cumingii*, Fée, Gen. Fil. 222. *M. Parishii*, Bedd. Ferns Brit. Ind. t. 184.

Eastern Bengal, alt. 0-500 feet, from Mishmee and Cachar to Chittagong, where it is plentiful. Sikkim Terai; Dulkajhar, *Gamble*.—Distrib. Ceylon, Burma, China, Philippines, Malacca.

M. simplex, Hook., has the fronds less divided, more cordate at the base, the secondary venation raised beneath, prominent, but seems very near.—*M. Parishii*, Bedd., is referred in Hk. & Baker, Syn. Fil. 392, to *M. cuspidatum*, Blume; but it is exactly our common form of *M. triphyllum* in the Chittagong Hills. An example collected in Mishmee by Griffith has 13 pinnae in all, and is marked *M. villosum*, J. Smith in Herb.

2. *M. CUSPIDATUM*, Blume, Enum. Pl. Jav. Fil. 114, Fl. Jav. Fil. 102, t. 45. Frond 1-pinnate; pinnae 3-6 in., pubescent or nearly glabrous except the rachis above, narrowly oblong, acuminate caudate, drying blackish, margin often crenulate.—Bedd. Ferns Brit. Ind. t. 309; Hk. & Baker, Syn. Fil. 392.

Jaintea; Jowye, alt. 4000 feet, *C. B. Clarke*. Sylhet, alt. 250 feet, *C. B. Clarke*.—Distrib. Java, Philippines.

I see no difficulty in distinguishing this from *P. urophyllum*, Wall. (as seen under

that species above); but it is very difficult to separate from *M. triphyllum*; indeed Mr. Baker has sorted our *M. triphyllum*, var. *Parishii*, under *M. cuspidatum*, Blume.

Var. *longifrons*, (sp.) Wall. Cat. 60. Pinnæ 12–15 in., glabrous, entire, with 15–20 pairs of uniting veinlets, suddenly narrowed into a subulate apex 1–2 in. long.

Himalaya and Khasia, alt. 500–4000 feet, very common.—This is probably a good species, but I can fix on no good diagnostic character; none of the Javan material approaches it, nor does it run into *P. urophyllum*, with which it is often confounded. It is marked *M. reticulatum* in the Kew bundles.

3. *M. DELTIGERUM*, Wall. Cat. 59. Fronds 1-pinnate, glabrous; fertile frond longer than the barren, the pinnæ little narrower than those of the barren, crenated; sori ultimately confluent, forming deltoid masses between the very distinct main veins beneath.—*Acrostichum virens*, var., Hk. & Baker, Syn. Fil. 420. *A. costatum*, var., Hook. Sp. Fil. v. 262; Bedd. Ferns Brit. Ind. t. 114.

Himalaya, alt. 500–2000 feet, from Nepaul to Bhotan, common. Chardooar and Roopraee Chang Hills, in Assam, *Simons*. Chittagong Hills, *C. B. Clarke*.

If the position of the sori and the nature of the venation be adjudged matters of no weight in ferns, this species may be got into the same genus with *Acrostichum virens*; it will then be very difficult to unite it specifically, as there are no intermediate forms, and the fertile pinnæ are only slightly dimorphous. Col. Beddome's figure unfortunately does not show the main veins beneath the fertile pinna, which are very strong and a diagnostic mark.

37. ANTROPHYUM, Kaulf.

1. *A. CORIACEUM*, Wall. Cat. 43. Stipe 0 or short; frond linear lanceolate acuminate, 3–12 by $\frac{1}{4}$ – $1\frac{1}{4}$ in., plicate, owing to the sori being much sunk in the frond, their lines distinctly raised on the upper surface.—Hook. Sp. Fil. v. 169; Hk. & Baker, Syn. Fil. 393. *A. plicatum*, Fée, 3^{me} Mém. Foug. 44, t. 5. fig. 1. *Hemionitis coriacea*, Don, Prodr. Fl. Nep. 13.

Nepaul, *Wallich*. Sikkim; alt. 2000–5000 feet, *C. B. Clarke*. Mishmee, *Griffith*. Khasia, *Griffith*, *Simons*, alt. 250 feet at Shaila, *C. B. Clarke*.—Distrib. Mergui.

There are both trigonous and ovoid spore-cases in this species; perhaps in all. Col. Beddome doubts (with reason), Ferns Brit. Ind. Suppl. p. 25, whether the species is distinct from *A. reticulatum*.

2. *A. PLANTAGINEUM*, Kaulf.; Bory in Voy. de la Coq. Bot. Crypt. t. 28. fig. 1. Stipes many of them long; frond oblong, acute, not plicate; sori immersed.—Fée, 3^{me} Mém. Foug. 45; Carr. in Fl. Viti. 371. *A. reticulatum*, Bedd. Ferns South. Ind. t. 52.

Sikkim; Tchonpong, alt. 4000 feet, Dikeeling, alt. 5000 feet, *C. B. Clarke*. Assam, *Simons*. Khasia, *Griffith*.—Distrib. Ceylon, Malaya, Polynesia.

This differs from *A. reticulatum* by the long stipes, from *A. latifolium* by the frond

not obovate nor lobed at the summit, and by the sori more sunk in the substance of the frond.

3. *A. RETICULATUM*, Kaulf.; Fée, 3^{me} Mém. Foug. 44. Stipe short or 0; frond linear or linear-lanceolate, 8-10 by $\frac{1}{4}$ - $1\frac{1}{2}$ in., not plicate; sori immersed.—Wall. Cat. 40; Hook. Sp. Fil. v. 169; Bedd. Ferns South. Ind. t. 231; Hk. & Baker, Syn. Fil. 393; Benth. Fl. Austral. vii. 777, in part. *A. falcatum*, Blume, Fl. Jav. Fil. 76, t. 32. *Hemionitis reticulata*, Forst. Prodr. 79.

Sikkim, Dr. Jerdon.—Distrib. Ceylon, Malacca, Polynesia, Queensland.

There is only one North-Indian specimen now left in the Kew bundle, and that I suspect is our common *A. coriaceum*, dried under much pressure by Dr. Jerdon, so as to show the plication less than usual. Wallich's *A. reticulatum* is very large, 3-4 in. broad.—Fée says his *A. reticulatum* has a long stipe, and quotes as a picture Blume's Fl. Jav. Fil. t. 32, which shows the fronds attenuate to the rhizome.

Var. *parvula*. Fronds 1-4 by $\frac{1}{8}$ - $\frac{1}{2}$ in., sides very parallel; sori appearing as though forming parallel lines the whole length of the frond, but really reticulating.

Sikkim, W. S. Atkinson; Yoksun, alt. 4500 feet, C. B. Clarke.—I know no reason why this should not really be the same as *A. parvulum*, Blume, Fl. Jav. Fil. 78, t. 34. fig. 3. That figure represents the fronds as being rather larger, with less parallel sides, the sori in less continuous lines.

4. *A. LATIFOLIUM*, Blume, Fl. Jav. Fil. 75. Stipe long; frond large, broadly obovate, often acuminate or acutely lobed at the apex; sori superficial, ultimately elevated beneath.—Fée, 3^{me} Mém. Foug. 48; Hook. Sp. Fil. v. 172; Bedd. Ferns Brit. Ind. t. 176; Hk. & Baker, Syn. Fil. 394. *A. Boryanum*, Blume, Fl. Jav. Fil. 75, t. 31, not of Hk. & Grev. *Hemionitis Boryana*, Blume, Enum. Pl. Jav. Fil. 111, syn. excl.

Sikkim and Bhotan, alt. 2000-6000 feet, frequent. Assam and Khasia, alt. 1000-4000 feet, frequent.—Distrib. Java.

My large Sikkim examples are 15 by $4\frac{3}{4}$ in., the anterior margin acutely lobed, and are easily called *A. latifolium*. But my smallest Sikkim examples are $3\frac{1}{4}$ by 4 in.; and, except that they are obovate, often lobed or notched at the vertex, I do not know how they are to be separated from *A. plantagineum*: I see no tangible difference in the elevation of the sori beneath.

38. VITTARIA, Smith.

1. *V. ELONGATA*, Swartz, Syn. Fil. 109, 302. Rhizome somewhat long; scales many, with long, very black hair-like points; fronds 4-26 by $\frac{1}{8}$ - $\frac{1}{2}$ in.; midrib distinct beneath, even in the upper half of the frond; outer lip of the involucre not distinguishable from the margin of the frond; sori ultimately elevated.—Wall. Cat. 144; Fée, 3^{me} Mém. Foug. 22, t. 3. fig. 5; Bedd. Ferns South. Ind. t. 21; Hk. & Baker, Syn. Fil. 395; Luerssen, Fil. Graeff. 90, cum syn. *V. rigida*, Kaulf.; Wall. Cat.

143; Hook. Sp. Fil. v. 184; Carr. in Fl. Viti. 372. *V. plantaginea*, Hk. & Grev. Ic. Fil. t. 187. *V. zosterifolia*, Bory; Fée, 3^m Mém. Foug. t. 2. fig. 2; Hook. Sp. Fil. v. 188. *Pteris angustifolia* and *graminifolia*, Roxb. in Calc. Journ. Nat. Hist. iv. 502, 503, t. 33.

Plain of North India, abundant; from the sea-face of the Soonderbun to the inner Himalayan valleys, but not often found above 4000 feet alt.—Distrib. South India, Ceylon, Burma, Malaya, Queensland, Polynesia, Mauritius, Tropical Africa.

A very uniform fern; the large examples reach 24 in. often, and are *V. elongata* of Wallich, *Pteris graminifolia*, Roxb.; the shorter fronds of 6–10 in. are *V. rigida*, Wall., = *Pteris angustifolia*, Roxb.—Without examination of the involucre this species (as to the Indian material) is easily sorted from the next by the rhizome and scales.

2. *V. FLEXUOSA*, Fée, 3^m Mém. Foug. 16. Rhizome very shortly creeping; stipes tufted; scales acuminate, with slaty-brown or fuscous caudate points; fronds 4–18 by $\frac{1}{8}$ – $\frac{1}{2}$ in., midrib distinct beneath even in the upper half of the frond; outer lip of the involucre easily distinguishable from the margin of the frond; sori sunk in a groove, ultimately more or less exsert.—Hook. Sp. Fil. v. 178; Luerssen, Fil. Graeff. 84, 92. *V. lineata*, Roxb. in Calc. Journ. Nat. Hist. 509, t. 33; Hook. Sp. Fil. v. 180, as to the Indian material; Hk. & Baker, Syn. Fil. 396, as to the Indian material. *Tæniopsis lineata*, Bedd. Ferns South. Ind. t. 54.

Himalaya, alt. 2000–12,000 feet; from Gurwhal to Bhotan, very common. Khasia, alt. 1000–6000 feet; very common.—Distrib. South India, Ceylon?

V. lineata, Swartz, with which this is united by Mr. Baker, has the stipes less tufted, the soral groove more marginal (as in the next species). *V. flexuosa* is very doubtfully distinct; but I have retained the name because all our North-Indian *V. lineata* belongs to this one form. The geographical distribution is of course as doubtful as the synonymy. Miquel's *V. japonica* seems the Himalayan plant.

3. *V. SIKKIMENSIS*, Kuhn in Linnæa, xxxvi. 66, as to the Sikkim plant only. Rhizome very shortly creeping, with slaty-rufous hair-pointed scales; stipes densely tufted; frond 3–4 by $\frac{1}{10}$ in., subobtuse, midrib beneath obscure or slightly depressed; soral lines large, marginal, the outer lip undistinguishable from the edge of the frond; sori, when young, deeply sunk in a groove; sporangiasters few, intestiniform, clavate; sporothecæ ovoid.—*V. minor*, Fée, var. *minima*; Bedd. Ferns Brit. Ind. t. 56. (Pl. LXXXIV. fig. 3.)

Sikkim, alt. 2000–6000 feet; common. Khasia, alt. 2500 feet, Mowlong, C. B. Clarke.

Kuhn put together this Sikkim tender grass-green species and the Moulmein and Malay plant *Vittaria minor*, Fée (*Tænitis pusilla*, Mett. in Ann. Mus. Lugd. Bat. iv. 172), which has a coriaceous broader frond, the midrib distinctly elevated beneath, stout wiry roots, the lines of sori four times as large, &c. This *V. minor* may be, as Mr. Baker notes, *V. falcata*, var.—Kuhn and Beddome had, however, only some starved scraps of the Sikkim plant to work with. This Sikkim species seems to me closely allied to the American *V. lineata*; except that it is small, I see no particular resem-

blance between it and *V. minor*, Fée. Fully developed Sikkim plants are much longer, but narrower than the form figured by Beddome.

39. TÆNITIS, Swartz.

1. *T. BLECHNOIDES*, Swartz, Syn. Fil. 24, 220. Fertile frond 1-pinnate; pinnae linear-lanceolate or linear entire; sori in a continuous line about midway between the midrib and the margin.—Wall. Cat. 141; Blume, Fl. Jav. Fil. t. 28. fig. 2 & t. 29; Fée, 3^m Mém. Foug. 26; Hook. Sp. Fil. v. 187; Bedd. Ferns Brit. Ind. t. 54; Hk. & Baker, Syn. Fil. 397. *T. pteroides*, Schk. Krypt. Gew. t. 6 b. *T. interrupta*, Wall. Cat. 142; Hk. & Grev. Ic. Fil. t. 63.

Sylhet; Wallich.—Distrib. Malay Peninsula and Islands, Ceylon.

The form *T. interrupta*, Wall., is hardly worthy the rank of a variety; it only differs from the type in having the lines of fruit more or less broken irregularly.—I do not doubt the locality of this plant, as Wallich has noted that his single specimen was forwarded him from Sylhet by his collector Da Silva, who collected there.

40. DRYMOGLOSSUM, Presl.

1. *D. CARNOSUM*, Hook. Sp. Fil. v. 189. Rhizome wide-creeping, bearing scattered lanceolate-linear spreading blackish scales; soral lines when young not marginal, but in age often covering nearly the whole frond.—Hk. & Bauer, Gen. Fil. t. 78 A; Fée, 3^m Mém. Foug. 29; Bedd. Ferns Brit. Ind. t. 55; Hk. & Baker, Syn. Fil. 397. *Notholæna carnosus*, Wall. Cat. 138.

Nepaul, Sikkim, Bhotan, Khasia, alt. 2000–5000 feet, frequent.

Fertile fronds sometimes linear, sometimes elliptic. The species is easily distinguished from the next by the scales of the rhizome: Hooker both figured and described the scales of *D. carnosum* from a rhizome of *D. piloselloides*, and Beddome's figure of the scales is rather suggestive of a compromise than characteristic. *D. subcordatum*, Fée (not an Indian form), has the rhizome densely clothed with spreading linear scales, and may be a variety of *D. carnosum*.

2. *D. PILOSELLOIDES*, Presl, Tent. Pterid. 227, t. 10. figs. 5, 6. Rhizome wide-creeping, clothed completely with adpressed, peltate, diamond-shaped, fulvous-red scales; soral lines when young marginal.—Fée, 3^m Mém. Foug. 28; Hook. Garden Ferns, t. 46, Sp. Fil. v. 190; Bedd. Ferns South. Ind. t. 55; Hk. & Baker, Syn. Fil. 398. *Pteris piloselloides*, Linn. Sp. Pl. 1530; Swartz, Syn. Fil. t. 2. fig. 3; Schk. Krypt. Gew. t. 87; Roxb. in Calc. Journ. Nat. Hist. 503. *Notholæna piloselloides*, Kaulf.; Wall. Cat. 139; Blume, Fl. Jav. Fil. 67. *Tænitis piloselloides*, R. Br.; Mett. Fil. Hort. Lips. 28, t. 10. figs. 6–8. *Acrostichum heterophyllum*, Linn. Sp. Pl. 1523.

Bengal Plain, common; to the base of the hills in Assam, Cachar, Chittagong; and along the base of the Himalaya west to Kumaon.—Distrib. Burma, Malaya.

I cannot find the Ceylon example. Beddome's Nilgherry example, figured as *Nipho-*
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bolus nummulariaefolius, Bedd. Ferns South. Ind. t. 186, has the surface of the fronds with stellate hairs, and the scales of the rhizome quite unlike the Bengal plant, and is *Drymoglossum Beddomei*, nov. sp.

41. HEMIONITIS, Linn.

1. *H. ARIFOLIA*, Bedd. Ferns Brit. Ind. Suppl. p. 25. Rhizome very short; fertile stipes much longer than the cordate entire fronds.—*H. cordifolia*, Roxb., Wall. Cat. 44, in Calc. Journ. Nat. Hist. iv. 500. *H. cordata*, Hk. & Grev. Ic. Fil. t. 64; Hook. Sp. Fil. v. 192; Bedd. Ferns South. Ind. t. 53; Hk. & Baker, Syn. Fil. 398. *H. sagittata*, Fée, Gen. Fil. 172, t. 14 D. *H. hastata*, R. Br. in Wall. Cat. 2170. *Asplenium arifolium*, Burm. Fl. Ind. 231; Rheede, Hort. Mal. xii. t. 10.

East Bengal Plain; abundant on red laterite. Also on the southern margin of Behar.—Distrib. South India, Ceylon, Philippines.

2. *H. GRIFFITHII*, H. f. & T.; Hook. Sp. Fil. 192. Rhizome shortly creeping; stipes paleaceous and coarsely hirsute; fronds hairy, pinnate or pinnatifid.—Hk. & Baker, Syn. Fil. 399. *H. Wilfordii*, Hook. Fil. Exot. t. 93. *Dictyocline Griffithii*, Moore; Bedd. Ferns Brit. Ind. t. 155.

Khasia; alt. 4000–5000 feet, local but in large quantity, as in the woods about the Poonjee at Cherra.—Distrib. Formosa.

The fronds from young rhizomes are pinnatifid, usually barren; those from strong rhizomes pinnate, both barren and fertile.

Pinnæ with parallel main lateral veins which are usually without sori, but sometimes soriferous in the upper part of the same frond: veins completely inarching into many rows of subhexagonal areolæ.

42. ACROSTICHUM, Linn.

Subgenus I. *Elaphoglossum*. Veins free. Fronds simple, coriaceous.

1. *A. CONFORME*, Swartz, Syn. Fil. 10, 192, t. 1. fig. 1. Scales of the rhizome ovate-lanceolate, not hair-pointed; stipes often squamose, not hairy.—Blume, Fl. Jav. Fil. 23, t. 5; Fée, 2^{me} Mém. Foug. 30; Hook. Sp. Fil. v. 198; Hk. & Baker, Syn. Fil. 401; Benth. Fl. Austral. vii. 778. *A. laurifolium*, Thouars; Fée, 2^{me} Mém. Foug. 37, t. 7. fig. 1. *A. Gayanum*, Fée, 2^{me} Mém. Foug. 37, t. 19. fig. 2. *A. glandulosum*, Hk. & Grev. Ic. Fil. t. 3. *A. marginatum*, Wall. Cat. 17; Fée, 2^{me} Mém. Foug. 31. *A. angulatum*, Blume, Fl. Jav. Fil. 25, t. 6; Fée, 2^{me} Mém. Foug. 52. *A. gorgoneum*, Blume, Fl. Jav. Fil. 28, t. 8; Fée, 2^{me} Mém. Foug. 38. *Elaphoglossum conforme* and *laurifolium*, Bedd. Ferns South. Ind. tt. 198, 200.

Sikkim and Nepaul; alt. 6000–9000 feet, frequent. Khasia, alt. 4500–6000 feet, rather common.—Distrib. South India, Ceylon, Malaya, Queensland, Polynesia. Central and Southern Africa and America.

Nearly every separate specimen that I have collected in India will make a species at Fée's standard of species-making; and yet the fern is not a variable one.

2. *A. viscosum*, Swartz, Syn. Fil. 10, 193. Rhizome very short, with lanceolate hair-pointed scales; stipes and frond more or less pubescent, often stellate-hairy or squamose.—Hk. & Grev. Ic. Fil. t. 61; Wall. Cat. 15; Blume, Fl. Jav. Fil. 27; Fée, 2^me Mém. Foug. 45; Hook. Sp. Fil. v. 220; Hk. & Baker, Syn. Fil. 406. *A. neriifolium*, Wall. Cat. 16. *A. stelligerum*, Wall. Cat. 2167; Hk. & Baker, Syn. Fil. 2nd ed. 521. *Elaphoglossum viscosum*, Bedd. Ferns South. Ind. t. 196.

Sikkim and Nepal, alt. 6000–8000 feet, frequent. Khasia, alt. 4000–6000 feet, rather common.—Distrib. South India, Ceylon, Malaya, Southern and Tropical Africa, Tropical America.

The North-Indian material is very uniform. The Kew bundle of *A. stelligerum* (all from the South Indian Mts.) contains plants which I cannot distinguish from the Khasia *A. viscosum*, nor can Col. Beddome (see Ferns Brit. Ind. Suppl. p. 26). *A. stigma-tolepis* (from the Nilgherries), Fée, 2^me Mém. Foug. t. 25. fig. 2, seems to me nearer *A. conforme* than *A. viscosum*.

Subgenus II. *Stenochlæna* (cum *Polybotrya* and *Egenolfia*). Veins free.

Fronds pinnate or deeply pinnatifid.

3. *A. PALUSTRE*, Bedd. Ferns Brit. Ind. Suppl. p. 26. Climbing often 30–40 feet high on trees; barren pinnæ of shining hard texture, margin serrate or entire; veins close, parallel, furcate near the base or simple.—*A. scandens*, Hook. Sp. Fil. v. 412; Hk. & Baker, Syn. Fil. 412; Benth. Fl. Austral. vii. 778. *Lomaria scandens*, Willd. Sp. Pl. v. 293. *L. limonifolia*, Wall. Cat. 36. *Pteris scandens*, Roxb. in Calc. Journ. Nat. Hist. iv. 505. *Stenochlæna scandens*, J. Smith; Hk. & Bauer, Gen. Fil. t. 105 B; Carr. in Fl. Viti. 373; Bedd. Ferns South. Ind. t. 201. *Polypodium palustre*, Burm. Fl. Zeyl. 234.

Throughout the plain of Bengal, abundant; and in the tropical valleys within the neighbouring mountains, rarely ascending so much as 2000 feet.—Distrib. South India, Ceylon, Malay Peninsula and Islands, South China, Queensland, Polynesia.

This fern though plentiful at Calcutta rarely fruits there; while 50 miles eastwards it fruits abundantly.

4. *A. APPENDICULATUM*, Willd. Sp. Pl. v. 114. Rhizome very short; barren pinnæ a heavy green; veins branching pinnately.—Hook. Exot. Fl. ii. t. 108, Sp. Fil. v. 251; Hk. & Baker, Syn. Fil. 415. *A. viviparum*, Wall. Cat. 28; Hook. Exot. Fl. ii. t. 107. *A. Hamiltonianum*, Wall. Cat. 29. *A. Wightianum*, Wall. Cat. 2163. *A. ludens*, Wall. Cat. 2685. *A. asplenifolium*, Bory in Bélanger, Voy. Bot. 23, t. 3. *A. setosum*, Wall. Cat. 30. *Polybotrya appendiculata*, Bedd. Ferns South. Ind. tt. 194, 195, Ferns Brit. Ind. tt. 110, 111. *P. marginata*, Blume, Fl. Jav. Fil. 18, t. 3. *P. intermedia*, J. Smith; Fée, 2^me Mém. Foug. 76, t. 40. fig. 1. *P. nodiflora*,

Bory; Fée, 2^m Mém. Foug. 77, t. 38. fig. 2. *P. neglecta*, Fée, 2^m Mém. Foug. 76, t. 39. fig. 2. *Lacaussadea montana*, *appendiculata*, and *rhizophylla*, Gaud. Voy. Bonite, tt. 118, 119, 120.

Round Bengal from Nepaul to Bhotan and Chittagong, near the base of the hills, very common, and ascending to 5000 feet alt.; most plentiful at alt. 1000–3000 feet.—Distrib. South India, Ceylon, Malay Peninsula and Islands to the Philippines and Hongkong.

My smallest specimens have the fronds (fertile and barren) 3–4 in. long, including the stipes, and in full fruit; my largest barren frond collected is 44 in. long without the stipe, and has the stipe and main rhachis clothed most densely with ovate dull-brown scales. The barren pinnæ in the commonest form are crenate subpinnatifid, sometimes they are entire, sometimes deeply pinnatifid; also pinnatifid and 2-pinnate barren fronds occur. The frond often is produced into a caudate extremity and roots near the extremity; this is the *A. viviparum*, Wall. Wallich's *A. ludens*, Wall. Cat. 2685, is not the Ceylon *A. ludens* of Beddome and Thwaites, but the commonest typical form of *A. appendiculatum* from Sylhet Mts. The most striking variety is

Var. *Hamiltoniana*, Wall. Barren pinnæ large, broad, subentire; fertile linear, subpinnate, so as to appear beaded.

Chiefly in Chittagong and Malaya.—Forms in which the fertile pinnæ are oblong subentire, linear, linear-pinnatifid, and linear-pinnate are found on rhizomes producing barren fronds with pinnatifid pinnæ.

Subgenus III. *Aconiopteris*. Veins uniting only to form a vein running close round the margin of the frond.

5. *A. GORGONEUM*, Kaulf. Enum. Fil. 63, not of Blume. Barren fronds simple, entire, narrowly elliptic, tapering at both ends; veins parallel, close, simple or furcate.—Hook. Sp. Fil. v. 264; Hk. & Baker, Syn. Fil. 416. *Aconiopteris obtusa*, Fée, 2^m Mém. Foug. 80, t. 40. fig. 2.

Khasia, alt. 2500 feet; above Shaila, C. B. Clarke.—Distrib. Sandwich and Society Islands.

I collected once a considerable quantity of this fern, but none in fruit: it must, however, be either *A. gorgoneum*, Kaulf., or some very closely allied species.—Rhizomes very short, with ovate-lanceolate obtuse brown-red scales; stipes tufted, scarcely an inch long, being usually winged nearly to the base by the decurrent frond: fronds 3–5 by $\frac{3}{4}$ –1 $\frac{1}{4}$ in., glabrous, with peltate flat scales sparingly scattered on the surface beneath; midrib strong: texture firm but diaphanous, the marginal vein more distinct and further from the margin than in any example of *A. gorgoneum* from Polynesia.

Subgenus IV. *Gymnopteris*. Veins anastomosing copiously. Barren and fertile fronds distinct.

6. *A. VARIABLE*, Hook. Sp. Fil. iv. 277. Rhizome shortly creeping, squamose, with

ovate or lanceolate scales; fronds simple; barren frond not diaphanous, but the venation distinct, main veins more or less traceable in zigzag course to the edge; areolæ with many free included veins.—Hk. & Baker, Syn. Fil. 417. *A. rivulare*, Wall. Cat. 2165. *Gymnopteris variabilis*, Bedd. Ferns Brit. Ind. t. 272. *G. decurrens*, Hook. Garden Ferns, t. 6. *Leptochilus decurrens*, Blume, Enum. Pl. Jav. Fil. 206; Fée, 2^m Mém. Foug. 88, t. 48. fig. 2. *Osmunda lanceolata*, Roxb. in Calc. Journ. Nat. Hist. iv. 479, t. 27.

Sikkim, Bhotan, Assam, Khasia, Cachar; alt. 250–4000 feet, common.—Distrib. South India, Ceylon, Burma, Java.

The distribution is doubtful, this fern being difficult to distinguish, not merely from the var. *lanceolata*, but from *A. axillare*.

Var. *lanceolata*, (sp.) Hook. Sp. Fil. v. 276. Zigzag main veins less distinctly traceable, sometimes the venation such that it cannot be made out which veins are the main veins.—Hk. & Baker, Syn. Fil. 420. *Gymnopteris Féei*, Bedd. Ferns South. Ind. t. 48. *Leptochilus lanceolatus*, Fée, 2^m Mém. Foug. 87, t. 47. fig. 1.

Chota Nagpore, alt. 3500 feet, Parasnath; C. B. Clarke.—Distrib. South India, Ceylon, Burma.

7. *A. AXILLARE*, Cav.; Hook. Sp. Fil. v. 276. Rhizome slender, tortuous, elongate, ascending trees, naked or nearly so; fronds simple; barren frond diaphanous; main veins more or less distinct; areolæ with many free included veinlets.—Hk. & Baker Syn. Fil. 420. *Gymnopteris axillaris*, Presl, Tent. Pterid. 244, t. 11. figs. 4, 5; Bedd. Ferns Brit. Ind. t. 271. *Leptochilus axillaris*, Kaulf. Enum. Fil. 147, t. 1. fig. 10. *Lomaria? serpens*, Wall. Cat. 32. *Polypodium hymenodes*, Wall. Cat. 283.

Plain of Bengal and Assam to the base of the hills, frequent.—Distrib. Pegu.

Barren fronds usually stipitate; but there is a form collected by Wallich and Griffith with small sessile barren fronds reduced in this place.

8. *A. MINUS*, Mett. Fil. Hort. Lips. 20. Rhizome very slender, shortly creeping in river sands, scales many, lanceolate; fronds simple; barren frond thin, opaque; main veins not distinctly traceable to the edge.—Hook. Sp. Fil. v. 277; Hk. & Baker, Syn. Fil. 420. *Leptochilus minor*, Fée, 2^m Mém. Foug. 87, t. 25. fig. 3 (excl. syn. *G. normalis*, J. Smith). *Gymnopteris minor*, Hook. 2nd Cent. Ferns, t. 78; Bedd. Ferns Brit. Ind. t. 116.

Khasia, alt. 2000–4500 feet; Hook. f. & T. Thoms.; C. B. Clarke, frequent.

Beddome observes (Ferns Brit. Ind. Suppl. p. 26) that this fern is probably a small form of *Gymnopteris lanceolata* (i. e. *Acrostichum variabile* above); and I can state no difference, except that the fronds are much smaller, with a much slenderer rhizome, and I find no examples of intermediate size.

9. *A. FLAGELLIFERUM*, Wall. Cat. 25. Barren pinnæ 7–11 (or when the terminal pinna is proliferous 5–3–1 only), 5 by 2 in., entire or nearly so, a series of costal arches

without included veins along their midribs; primary lateral veins distinct, parallel; intermediate secondary venation irregular, with few free veinlets; fertile pinnæ 3 by $\frac{3}{4}$ in.—Hk. & Grev. Ic. Fil. t. 23; Blume, Fl. Jav. Fil. 37, t. 13; Hook. Sp. Fil. v. 259; Hk. & Baker, Syn. Fil. 418. *A. diversifolium*, Blume, Fl. Jav. Fil. 36, t. 12. *Pacilopteris flagellifera*, Bedd. Ferns Brit. Ind. t. 112. *Heteroneuron heteroclitum* and *diversifolium*, Fée, 2^m Mém. Foug. 91, 92.

Round Bengal at the base of the hills, alt. 0–3000 feet; from Sikkim to Assam, Cachar, and Chittagong; common (at least the sterile fronds).—Distrib. Burma, Malaya, Philippines.

This fern appears in two states, viz.:—(1) The Indian walking-leaf: the rhizome is here short terrestrial, the fronds commonly with 3 (sometimes with 5 or 1) pinnæ; the terminal pinna prolonged often a foot or more, rooting near the vertex. I have never seen it fruiting in this state, nor have any of the flagelliferous fronds in the Herbarium any fruiting fronds attached, though there are fruiting fronds mounted with them. (2) Scandent several feet up trees; rhizome strong, densely scaly, with brown lanceolate scales at its extremities; the rhizome throws out radicles completely encircling boughs like tendrils; the fronds here have usually 7–9 pinnæ. Fruiting fronds are in this state rare; there are no fronds in young fruit in the herbarium; it would seem that the fruit arises in patches between the parallel main veins, and that the plant is allied to *Meniscium deltigerum*, Wall.—This plant is separable by the fertile fronds with the venation from every form of *A. virens* and *A. costatum*, but not by the number of its pinnæ. I cannot see how *A. repandum*, Blume (Hk. & Baker, Syn. Fil. 419), differs; it does not differ in number of pinnæ.

10. *A. CRISPATULUM*, Wall. Cat. 24. Barren pinnæ numerous, often 20 or more, 4 by $\frac{1}{2}$ in., slightly serrate, the midrib often reddish when dry, a series of costal arches without included veins along their midribs, no free veins in any of the areolæ; fertile pinnæ 4 by $\frac{1}{8}$ – $\frac{1}{4}$ in.—*A. virens*, var., Hook. Sp. Fil. v. 261; Hk. & Baker, Syn. Fil. 420. (Pl. LXXXIV. fig. 2, b, d.)

Round Bengal from Kumaon to Bhotan and Chittagong in the lower hills, alt. 0–3000 feet, common.

The only very common Bengal species of the group called *A. virens* by Mr. Baker. Very constant in character, and easily recognized by the absence of free veins.

Var. *contaminans*, Wall. Cat. 22. Barren pinnæ often $\frac{3}{4}$ –1 in. broad, more crenated, green or yellowish; fertile pinnæ $\frac{1}{8}$ – $\frac{1}{4}$ in. broad. (Pl. LXXXIV. fig. 2, a, c.)

Grows with the preceding; a trifling variety.

Var. *Blumeana*. Areolæ less elongate, irregularly hexagonal.

Cachar, R. L. Keenan.—This is *A. Blumeanum*, Hk. & Baker, Syn. Fil. 423, as to the North-Indian material placed in the bundle by Mr. Baker: I say nothing as to some of the Polynesian examples.

Var. pseud-undulata. Midrib of the fertile pinnæ without sori in the fully ripe

Khasia, *Griffith*; a solitary example, having exactly the venation of the North-Indian *A. crispatum* type, and not that of the Tenasserim true *A. undulatum*, Wall. Cat. 140; see Bedd. Ferns Brit. Ind. t. 115.

11. *A. VIRENS*, Wall. Cat. 1033. Barren pinnæ usually 9–15, 6 by $1\frac{1}{2}$ in., slightly serrate, green, a series of costal arches without included veins along their midribs; primary lateral veins distinct, parallel, intermediate secondary veins anastomosing freely, with included free veinlets; fertile pinnæ 2–3 by $\frac{1}{2}$ – $\frac{1}{4}$ in.—Hk. & Grev. Ic. Fil. t. 221. *A. terminans*, Wall. Cat. 2168 (all the Wallichian type-sheets).;

Chittagong Hills, alt. 0–1000 feet, *C. B. Clarke*.

I have twice collected this, the barren fronds only: there is none from North India in the Kew Herbarium, and Wallich's Herbarium No. 1033 is a blank sheet of paper. I quote no synonyms, for Baker (Syn. Fil. 420) takes as the type of his *A. virens*, Hk. & Grev. Ic. 221, and then says "free veinlets none;" whereas Hk. & Grev. Ic. abounds in free veins. The fact is that the fronds of this species without free included veinlets are *A. flagelliferum*. This fern is hardly separable as a var. from

A. subcrenatum, Hk. & Grev. Ic. Fil. t. 110. Often proliferous, the free included veinlets having a tendency to regular series between the main veins.—*A. proliferum*, Hook. Ic. Pl. t. 681–2. *Pæcilopteris terminans*, Bedd. Ferns South. India, t. 203. *Polybotrya virens*, Bory; Hook. 2nd Cent. Ferns, t. 88. *Heteroneuron proliferum*, Fée, 2^{me} Mém. Foug. t. 55.

Appears plentiful in Southern India; no example from North India.

12. *A. COSTATUM*, Wall. Cat. 26. Barren pinnæ about 11, 8–14 by $2-2\frac{3}{4}$ in., caudate, stout in texture, drying red, costal arches none or obscure from the presence within them of other veins; secondary areolation copious, with included free veins; fertile pinnæ 6 by $\frac{1}{4}$ – $\frac{1}{2}$ in.—Hook. Sp. Fil. v. 262 as to var. α only. *Pæcilopteris costata*, Bedd. Ferns Brit. Ind. t. 113.

Round Bengal in the lower hills, alt. 0–3000 feet; from Nepaul to Chittagong, common.

One of the best marked among the Indian *Acrostichums*: its large size, its drying red, its want of costal arches to the midribs of the barren pinnæ, easily distinguish it from all others. It has been joined with *Meniscium deltigerum*, Wall., and with *Acrostichum virens*, Wall., and the descriptions founded on material thus jumbled are not intelligible, but the fern itself is.

13. *A. TRIOSPIS*, Hook. Sp. Fil. v. 272, t. 304; Hk. & Baker, Syn. Fil. 422. *Gymnopteris triospis*, Bedd. Ferns Brit. Ind. t. 53.

Sikkim; Goke, below Darjeeling, alt. 1500 feet.

Scales of the rhizome lanceolate, hair-jointed, chestnut-coloured. Barren frond with the upper part of one or more of its lobes frequently fertile; but similar varieties occur in many *Acrostichums*, as in *A. viscosum*, *flagelliferum*, &c.—This fern was first brought to Mrs. Atkinson by her Bhotea collector, who got it on trees on the Goke spur: many

persons have got it from that locality since, and it has been much thinned there. I am not aware that it has ever been obtained from any other place.

Subgenus V. *Chrysodium*. Veins anastomosing copiously, without free veinlets.

Fronds simple or pinnate, imperfectly dimorphous.

14. *A. AUREUM*, Linn. Sp. Pl. 1525. Fronds 1-pinnate; uppermost pinnæ soriferous, scarcely smaller than the lower barren pinnæ.—Schk. Krypt. Gew. t. 1 & 1 b; Hook. Sp. Fil. v. 266; Wall. Cat. 31; Bedd. Ferns South. Ind. t. 204; Hk. & Baker, Syn. Fil. 423; Benth. Fl. Austral. vii. 779. *A. emarginatum*, Roxb. in Calc. Journ. Nat. Hist. iv. 480, t. 27. *A. speciosum* and *inæquale*, Willd.; Blume, Fl. Jav. Fil. 40, 42, tt. 16, 17. *A. daneæfolium*, Langsd. & Fisch. Pl. Voy. Russ. 5, t. 1. *Chrysodium fraxinifolium*, D'Urvillei, sculpturatum, and *Cayennense*, Fée, 2^m Mém. Foug. tt. 62, 60, 61, and 59. *C. aureum*, Carr. in Fl. Viti. 375.

Lower Bengal, common. Abundant in the Soonderbun; and I have collected it in the streets of Calcutta.—Distrib. Tropical shores, nearly throughout the world; a fern that likes sea-air.

Subgenus VI. *Hymenolepis*. Veins anastomosing copiously, with many free veinlets.

Fronds linear, simple, soriferous on the contracted apex.

15. *A. SPICATUM*, Linn. f. Suppl. 444. Soriferous part of the frond less than $\frac{1}{2}$ in. broad.—Smith, Ic. Ined. t. 49; Hook. Sp. Fil. v. 280; Hk. & Baker, Syn. Fil. 424; Benth. Fl. Austral. vii. 780. *Hymenolepis spicata*, Presl; Hook. Fil. Exot. t. 78; Bedd. Ferns South. Ind. t. 46. *H. ophioglossoides*, Kaulf. Enum. Fil. 146, t. 1. fig. 9; Kunze, Farnkr. Schk. Suppl. t. 47. fig. 1. *H. revoluta*, Blume, Enum. Pl. Jav. Fil. 201; Kunze, Farnkr. Schk. Suppl. t. 47. fig. 2. *Gymnopteris spicata*, Presl; Tent. Pterid. 244, t. 11. fig. 7.

Sikkim and Bhotan, alt. 4000–7000 feet, common. Khasia, alt. 8000–5000 feet, common.—Distrib. Ceylon, Queensland, South China, Polynesia, Madagascar.

The sori are mixed with linear clavate sporangiasters, some of which are flat-headed. This differs no more from *Drymoglossum* than does *Drynaria coronans* from *D. quercifolia*, and less than does *L. Filix-Mas* from *L. cochleata*.

43. OSMUNDA, Linn.

1. *O. CLAYTONIANA*, Linn. Sp. Pl. 1521. Fronds 1-pinnate; pinnæ deeply pinnatifid, the uppermost and lowest barren, some of the intermediate fertile.—Schk. Krypt. Gew. t. 144; Bedd. Ferns Brit. Ind. t. 187; Hk. & Baker, Syn. Fil. 126; Milde, Monog. Gen. Osmund. 101–109, tt. 3, 4. figs. 77–100, Fil. Europ. 183. *O. monticola*, Wall. Cat. 52. *O. interrupta*, Michx. Fl. Am.-Bor. ii. 273.

Himalaya, alt. 6000–10,000 feet; from Kashmir to Bhotan, frequent. Khasia; alt. 4500–6000 feet, frequent.—Distrib. North America, Arctic and Temperate.

The Indian form is (so far as I know) always *O. interrupta*, Michx., i. e. the fertile fronds have only a few pinnæ in the middle fertile.

2. *O. REGALIS*, Linn. Sp. Pl. 1521. Frond 2-pinnate; barren and fertile fronds separate, or the frond barren below, fertile above.—Schk. Krypt. Gew. t. 145; Engl. Bot. t. 209; Bedd. Ferns South. Ind. t. 76; Hook. Brit. Ferns, t. 45; Milde, Monogr. Gen. Osmund. 58–88, tt. 1–3. figs. 1–65, Fil. Europ. 175; Hk. & Baker, Syn. Fil. 127. *O. japonica*, Thunb. Fl. Japon. 330. *O. speciosa*, Wall. Cat. 50. *O. Leschenaultii*, Wall. Cat. 51.

Kumaon, *T. Thomson*; *Strachey & Winterbottom*. Khasia and Bhotan, alt. 4000–6000 feet, common, or at least frequent.—Distrib. Mts. of Malabar, South China, Japan. Arctic and North Temperate regions of the world; South Africa, Brazil.

The common Khasi form is very small, 12–18 in. high only; the fertile and barren fronds separate: this is *O. japonica*, Thunb., = *O. speciosa*, Wall. But I have collected fronds of this barren below, fertile above. The Malabar plant, *O. Leschenaultii*, Wall., seems altogether identical with the European.

44. SCHIZÆA, Smith.

1. *S. DIGITATA*, Swartz, Syn. Fil. 150, 380, t. 4. fig. 1; Blume, Enum. Pl. Jav. Fil. 255; Mett. Fil. Hort. Lips. 114; Hook. Garden Ferns, t. 49; Carr. in Fl. Viti. 376; Bedd. Ferns South. Ind. t. 268; Hk. & Baker, Syn. Fil. 430. *Actinostachys digitata*, Wall. Cat. 1. *Acrostichum digitatum*, Linn. Sp. Pl. 1524.

Khasia, *Griffith*. Chittagong; tropical region, *Hook. f. & T. Thoms.*—Distrib. Ceylon, Malay Peninsula and Isles to the Philippines and Feejees.

45. LYGODIUM, Swartz.

1. *L. CIRCINATUM*, Swartz, Syn. Fil. 153. Fully developed barren frond bipartite into two palmate lobes or simply palmate; segments long-lanceolate.—Blume, Enum. Pl. Jav. Fil. 253; Benth. Fl. Hongk. 441. *L. pedatum*, Swartz, Syn. Fil. 154. *L. dichotomum*, Swartz, Syn. Fil. 154; Wall. Cat. 176; Hk. & Grev. Ic. Fil. t. 55; Bedd. Ferns South. Ind. t. 62; Hk. & Baker, Syn. Fil. 437. *L. longifolium*, Swartz, Syn. Fil. 154. *Ophioglossum circinatum* and *pedatum*, Burm. Fl. Ind. 227, 228, t. 66. fig. 1. *O. flexuosum*, Linn. f. Suppl. 443; Roxb. in Calc. Journ. Nat. Hist. iv. 477; not of Linn. Sp. Pl. 1519. *Hydroglossum circinatum*, *pedatum*, *dichotomum*, *longifolium*, Willd. Sp. Pl. v. 83, 84, 82.

Chittagong Hills; *C. B. Clarke*.—Distrib. Ceylon, Malay Peninsula and Islands to the Philippines and Hongkong.

2. *L. MICROPHYLLUM*, R. Br. Prodr. 162. Fronds all simply pinnate; barren pinnæ ovate-oblong, not acute, margin undulate subentire, or but minutely crenulate; fertile deltoid-ovate, petioled, never pinnated, rarely much lobate.—Wall. Cat. 174, except

the first specimen on the type sheet. *L. scandens*, Bedd. Ferns South. Ind. t. 61; Ettingh. Farn. Jetzw. t. 167. figs. 2, 4, 10, t. 169. fig. 3; Benth. Fl. Austral. vii. 961; Hk. & Baker, Syn. Fil. 437, partly; not of Swartz, Syn. Fil. 152. *Ugena microphylla*, Cav. Ic. t. 595. fig. 2. *Ophioglossum filiforme*, Roxb. in Calc. Journ. Nat. Hist. iv. 476, t. 26, upper figure.—Rheede, Hort. Mal. xii. t. 34.

Bhotan; Nuttall. Bengal Plain, rare; Cooch Behar, Sylhet, Chittagong, C. B. Clarke.—Distrib. South India, Ceylon, Malay Peninsula and Islands.

This fern is rare in Bengal, the only scrap in the Kew Herbarium being Nuttall's.—*Ophioglossum scandens*, Linn. Sp. Pl. 15, is founded, so far as the Indian material is concerned, on Rheede, Hort. Mal. xii. t. 33, which is exactly *L. flexuosum*, Bedd. Ferns South. Ind. t. 63. Swartz carefully distinguished his *L. scandens* as having serrated leaflets, and notes *Ugena microphylla* as differing. Roxburgh, R. Brown, and Wallich all discovered that the present plant was not that of Linnæus and Swartz. *L. microphyllum* is, I think, the best marked and least variable species in the genus.

3. *L. FLEXUOSUM*, Swartz, Syn. Fil. 153. Fertile frond 1-pinnate; pinnæ often 3-lobed or 3-partite, the terminal lobe or leaflet elongate, often 2–4 in.; barren fronds (from the upper part of a well-developed stem) similar, margin of the pinnæ usually serrate, scarcely crenate or lobed except as to the two smaller basal lobes.—Bedd. Ferns South. Ind. t. 63. *L. pinnatifidum*, Swartz, Syn. Fil. 153; Etting. Farn. Jetzw. t. 170. fig. 10; Hk. & Baker, Syn. Fil. 438. *Lygodium semihastatum*, Desv.; Hk. & Baker, Syn. Fil. 437 (at least as to Cav. Ic.). *L. serrulatum*, Blume, Enum. Pl. Jav. 254. *L. longifolium*, Wall. Cat. 175. *L. pubescens*, Wall. Cat. 2200. *L. polystachyum*, Wall. Cat. 177 partly, not type sheet. *Ophioglossum flexuosum*, Linn. Sp. Pl. 1519; Roxb. in Calc. Journ. Nat. Hist. iv. 477. *O. scandens*, Linn. Sp. Pl. 1518 (as to the Indian material); Roxb. in Calc. Journ. Nat. Hist. iv. 477, t. 26, lower figure. *Ugena polymorpha*, Cav. Ic. t. 595. fig. 1. *U. semihastata*, Cav. Ic. t. 594. fig. 1. *Hydroglossum flexuosum*, *pinnatifidum*, *auriculatum*, Willd. Sp. Pl. v. 83, 80, 84.—Rheede, Hort. Mal. tt. 32, 33.

Throughout Bengal Plain, abundant; extending into the hills up to 5000 feet alt., and west as far as Kumaon.—Distrib. South India, Ceylon, Malay Peninsula and Islands, Tropical Africa.

The barren fronds from near the base of a young stem are often undivided, 2–3-lobed or palmate; the next upwards are pinnate, with 2 or 3 or 4 pinnæ, or sometimes twice dichotomous. Linnæus founded his *A. scandens* on Rheede, Hort. Mal. xii. t. 32, and remarked of his *O. flexuosum*, founded on Rheede, Hort. Mal. t. 33, that it was “*nimis affinis*.” The two are only states of one plant. The same explanation applies to *L. semihastatum*, Desv.; but the solitary specimen in the Kew bundle so named exhibits a fruiting frond only, with very large pinnæ, and may be something distinct.

4. *L. JAPONICUM*, Swartz, Syn. Fil. 154. Barren pinnæ 2-pinnate, secondary pinnæ often lobed, fertile pinnæ less compound, terminal pinna long, narrow, serrate or crenate.

—Wall. Cat. 2201; Bedd. Ferns South. Ind. t. 64; Hk. & Baker, Syn. Fil. 439; Benth. Fl. Austral. vii. 962. *L. semi-bipinnatum*, R. Br. Prodr. 162. *L. tenue*, Blume, Enum. Pl. Jav. Fil. 254. *L. Finlaysonianum*, Wall. Cat. 2202. *Ophio-glossum japonicum*, Thunb. Fl. Jav. 328. *Hydroglossum japonicum*, Willd. Sp. Pl. v. 81.

Throughout North India abundant; extending west to Kashmir, and ascending the Mts. to 5000 feet alt.—Distrib. South India, Ceylon, Malay Peninsula and Islands, to China, Japan, and Australia.

This plant differs very little, in my eyes, from *L. flexuosum*; it has generally smaller fronds and pinnae; but the greater part of the Kew bundle of *L. microphyllum* was filled with the present plant, which seems to me abundantly distinct (see diagnosis of *L. microphyllum* above).

46. ANGIOPTERIS, Hoffm.

1. *A. EVECTA*, Hoffm.; Schk. Krypt. Gew. t. 151; Bedd. Ferns South. Ind. t. 78; Blume, Enum. Pl. Jav. Fil. 257; Hk. & Grev. Ic. Fil. t. 36; Hk. & Bauer, Gen. Fil. t. 10; Hook. Fil. Exot. t. 75; Hk. & Baker, Syn. Fil. 440; Benth. Fl. Austral. vii. 694.—*A. crassipes*, Wall. Cat. 187.

Round Bengal, alt. 0–7000 feet, from Nepaul to Bhotan and Chittagong; very common.—Distrib. South India, Ceylon, Malaya to Queensland and Polynesia, Madagascar.

This fern is common from 2500 feet down to the plain in Bengal, and extends out to Sylhet station. At these low levels it is usually small, 2–4 feet high. It is rare in the Himalaya in the region of cultivation, alt. 3000–5500 feet, but appears again in the wet forest at 6000–7000 feet alt., and is there very large, often 10–18 feet long.—De Vriese, in his Monogr. Marattiaceæ, divides *Angiopteris* into two sections and 60 species. All the Indian material belongs to the second section, which have no adventitious veinlets between the regular veins that start from the midribs of the pinnae. All the Indian material is very homogeneous, except as to trifling variation in size. The most marked var. is one of Griffith's, which has the barren pinnae strongly serrate sublaciniate; but it looks of the nature of a sport.

47. KAULFUSSIA, Blume.

1. *K. ÆSCULIFOLIA*, Blume, Enum. Pl. Jav. Fil. 260; Hk. & Grev. Ic. Fil. t. 229; Hk. & Bauer, Gen. Fil. t. 59 A; Bedd. Ferns Brit. Ind. t. 185; Hk. & Baker, Syn. Fil. 444. *K. assamica*, Griff. Notul. i., ii. 628. *K. æsculifolia*, *assamica*, *Korthalsii*, and *Lobbiana*, De Vriese, Monog. Maratt. 13, 14, t. 5. *Macrostoma*, Griff. Ic. Pl. As. Rar. t. 187.

Assam, Griffith. Cachar, R. L. Keenan. Chittagong Hills; alt. 250 feet, C. B. Clarke.—Distrib. Malaya, Philippines.

Frond digitately 3–5-lobed, or ovate-oblong, simple, and then often auricled or sub-lobate at the base.

48. OPHIOGLOSSUM, Linn.

1. *O. VULGATUM*, Linn. Sp. Pl. 1518. Rhizome short, producing annually 1-2 fronds; fertile segment springing from the base of the barren segment; barren segment ovate or oblong, acute or obtuse, narrowed regularly at the base, so that it is not spathulate nor spathulate cordate.—Schk. Krypt. Gew. t. 153; Engl. Bot. 108; Hk. & Bauer, Gen. Fil. t. 59 B; Hook. Brit. Ferns, tt. 46, 47; Milde, Fil. Europ. 188; Hk. & Baker, Syn. Fil. 445; Luerssen, in Journ. Mus. Godeffroy, viii. 114, tt. 12, 13; Benth. Fl. Austral. vii. 688.

Sikkim; Goke, alt. 4000 feet, *T. Anderson*; Rungait Camp below Darjeeling, alt. 2000 feet, *C. B. Clarke*.—Distrib. Scattered from England to New Zealand and Cape Colony. Also in North America.

Col. Beddome doubts (Ferns Brit. Ind. Suppl. p. 21) whether any of the Himalayan *Ophioglossum* should be called *O. vulgatum*, Linn. Dr. T. Anderson's excellent example seems to me as near the common English type as may be. My own specimens (from virtually the same locality) are smaller; but I should not call them a variety even: they would be excellently represented by Luerssen's plates quoted, figs. 68, 69, 73, &c.

Var. *Aitchisoni*. Rhizome elongate, bearing annually 4-10 fronds in succession, 2-2½ by ¾-¾ in., oblong, texture stout.

Punjab, alt. 2400 feet; Rawul Pindee and Hurroo, *J. E. T. Aitchison*.—There is no other *Ophioglossum* in the Herbarium, nor any picture much like this: the rhizome appears to bear a succession of fronds in one season; there are 1-2 fully developed, 1-2 young ones emergent, and several withered laminæ on the rhizome. A. Braun (in Seuber, Fl. Azorica, 17) describes an *O. polyphyllum*; but this has venose fronds, the whole plant only 1-2 in. high, and comes from Terceira, and is probably not near *O. Aitchisoni*.

2. *O. RETICULATUM*, Linn. Sp. Pl. 1518. Rhizome short, producing annually 1-2 fronds; fertile segment springing from the base of the barren segment; barren segment ovate, spathulate-cordate or spathulate.—Blume, Enum. Pl. Jav. Fil. 259; Wall. Cat. 2171; Hk. & Grev. Ic. Fil. t. 20; Milde, Fil. Europ. 190; Bedd. Ferns South. Ind. t. 70; Hk. & Baker, Syn. Fil. 446; Luerssen, in Journ. Mus. Godeffroy, viii. 110. *O. cordifolium*, Roxb. in Calc. Journ. Nat. Hist. iv. 475; Wall. Cat. 47.

Nepaul, *Wallich*. Darjeeling; *Griffith*. North-west India, *Dr. Jameson*.—Distrib. South India, Malaya, Polynesia, Tropical America and Africa.

I cannot make much of the more distinct venation, given as the specific character of this plant. Some of Griffith's examples with very cordate barren fronds are particularly opaque, more fleshy than most of *O. vulgatum*. When examples are picked very old, or killed by immersion in boiling water before drying, I believe their venation (whether *O. vulgatum* or *O. reticulatum*) will appear very distinct in the Herbarium.

3. *O. PENDULUM*, Linn. Sp. Pl. 1518. Fronds often many in one season from the

rhizome, often 12 in. long; barren segment linear, the fertile segment rising from its centre.—Blume, Enum. Pl. Jav. Fil. 260; Hk. & Grev. Ic. Fil. t. 19; Carr. in Fl. Viti. 378; Bedd. Ferns Brit. Ind. t. 269; Hook. Garden Ferns, t. 33; Hk. & Baker, Syn. Fil. 446; Lueresen, in Journ. Mus. Godeffroy, 116; Benth. Fl. Austral. vii. 689.

Upper Assam; Bruce.—Distrib. Ceylon, Malacca to Polynesia and Australia, Mauritius.

The single North-Indian example is marked "Sent to me from Upper Assam by Mr. D. Bruce, 1839," in handwriting supposed to be Helfer's. It will therefore be very desirable to strengthen the evidence for *O. pendulum* as a North-Indian species.

49. HELMINTHOSTACHYS, Kaulf.

1. *H. ZEYLANICA*, Hk. & Bauer, Gen. Fil. t. 48 B; Hook. 2nd Cent. Ferns, t. 94, Garden Ferns, t. 28; Bedd. Ferns South. Ind. t. 69; Hk. & Baker, Syn. Fil. 447; Benth. Fl. Austral. 690. *H. dulcis*, Kaulf. Enum. Fil. 28; Blume, Enum. Pl. Jav. Fil. 258; Wall. Cat. 54. *Osmunda zeylanica*, Linn. Sp. Pl. 1519; Roxb. in Calc. Journ. Nat. Hist. iv. 478. *Ophioglossum laciniatum*, Rumph. Herb. Amb. vi. t. 68. fig. 3. *Botrychium zeylanicum*, Swartz, Syn. Fil. 172. *Botryopteris mexicana*, Presl, Rel. Haenck. 76, t. 12. fig. 1.

Bengal Plain, from the Soonderbun to Assam and Cachar; common.—Distrib. Ceylon, Malacca, Malaya, Philippines, Queensland.

All the North-Indian examples at Kew are from the plain at (or hardly above) sea-level; and I have never met the plant in the hills even 250 feet above the sea. I believe the locality Himalayas, given in Hk. & Baker, Syn. Fil., is erroneous.

50. BOTRYCHIUM, Swartz.

1. *B. LUNARIA*, Swartz, Syn. Fil. 171. Barren segment sessile or nearly so, 1-pinnate; pinnae obovate, coriaceous.—Schk. Krypt. Gew. t. 154; Hook. Brit. Ferns, t. 48; Bedd. Ferns Brit. Ind. t. 208; Milde, Monog. Botrych. 47–62, t. 9. fig. 1, Fil. Europ. 192; Hk. & Baker, Syn. Fil. 447; Benth. Fl. Austral. vii. 690. *Osmunda Lunaria*, Linn. Sp. Pl. 1519; Engl. Bot. t. 318.

Sikkim; Lachen, alt. 11,000–13,000 feet, Sir J. D. Hooker. Kumaon; Tolu, alt. 12,000 feet, Strachey & Winterbottom. North-west India; Jameson. West Tibet; Falconer. Karakorum; alt. 12,500 feet, C. B. Clarke.—Distrib. Arctic and Cold Temperate zone, extending to South Europe. Patagonia; Australia.

2. *B. DAUCIFOLIUM*, Wall.; Hk. & Grev. Ic. Fil. t. 161. Barren segment petioled, 3-pinnatifid, margin finely toothed.—Hook. in Bot. Mag. t. 5340; Milde, Monog. Botrych. 117–122, Fil. Europ. 206; Hk. & Baker, Syn. Fil. 448. *P. subcarnosum*, Wall. Cat. 49; Bedd. Ferns South. Ind. t. 69. *B. sub-bifoliatum*, Brack. U. S. Explor. Ferns, t. 44.

From Nepal to Bhotan, alt. 5000–8000 feet; frequent.—Distrib. South India, Ceylon, Java, Polynesia.

After all the explanations of Sir W. J. Hooker in Bot. Mag. t. 5840, the fact remains that this plant is named *B. subacorneum* in Wallich's own type set, and that it was distributed by him under the same name.

3. *B. VIRGINIANUM*, Swartz, Syn. Fil. 171. Barren segment sessile, margin serrate or coarsely dentate.—Schk. Krypt. Gew. t. 156; Hook. Garden Ferns, t. 29; Bedd. Ferns South. Ind. t. 67; Hk. & Baker, Syn. Fil. 448. *B. lanuginosum*, Wall. Cat. 48; Hk. & Grev. Ic. Fil. t. 79; Milde, Monogr. Botrych. 118–117, Fil. Europ. 205. *Osmunda virginiana*, Linn. Sp. Pl. 1519.

Himalaya, alt. 5000–8000 feet; from Kumaon to Bhotan, common. Khasia, alt. 4000–6000 feet, very common.—Distrib. South India, Ceylon, Europe to Japan; America, very widespread.

Milde (Monogr. Botrych. & Fil. Europ. 191–209) divides *Botrychium* into two main sections, viz. :—

- (1) Cells of the epidermis straight.
- (2) Cells of the epidermis flexuose, secondary pinnæ of the lowest pair of primary pinnæ anadromous.

The second section contains *B. virginianum* (the American type plant) only; the first section comprises, among other species, *B. lanuginosum*, Wall., which Milde holds to be a good species, and which, besides the difference in the epidermis-cells, is said to have catadromous secondary pinnæ on the lowest pair of pinnæ.

All the Indian material that I have seems one species, and has the epidermis-cells straight, differing thus from the typical American *A. virginianum*, which has a different texture (perhaps consequently).—I can make very little of the subsidiary distinction. It may be useful to explain that the lowest primary pinnæ are often twisted in drying, but that the secondary pinnæ on their lower margin are usually more developed than on their upper.—These secondary pinnæ are said to be catadromous when the secondary pinna nearest the main rhachis is on the lower margin of the primary pinnæ, anadromous when the secondary pinna nearest the main rhachis is on the upper margin of the primary pinnæ. In the Indian *B. lanuginosum* the secondary pinnæ have a strong tendency to be catadromous, in the American *A. virginianum* to be anadromous: but in the Indian plant the lowest secondary pinnæ are often nearly opposite; sometimes they are slightly anadromous; and in one of my specimens the lowest pinna on one side has the secondary pinnæ anadromous; the lowest pinna on the other side has them catadromous. Milde finds in the Himalaya both *B. virginianum* and *B. lanuginosum*, which he reckons very distinct species. I certainly think that the Himalayan material is all one species: whether it can be separated from *A. virginianum* specifically is a much more difficult question.

51. *PSILOTUM*, Swartz.

Stems much branched dichotomously; leaves reduced to distant minute oblong-linear scales. Sporangia solitary in the axils of the leaves, sessile, triquetrous obovoid, 8-celled, dehiscent into 8 valves from the vertex. Spores oblong-ellipsoid, curved, with a short groove on the concave side.—Distrib. Species 2-3, in the tropical and sub-tropical regions of both hemispheres.

1. *Ps. nudum*, Griseb. Veg. Karaihen, 130. Fertile branches triquetrous; sterile leaves mostly solitary; sporangia with two leaves beneath.—*Ps. triquetrum*, Swartz, Syn. Fil. 187; Schk. Krypt. Gew. t. 165 b; Hk. & Bauer, Gen. Fil. t. 88; Hook. Fil. Exot. t. 63; Wall. Cat. 46; Griff. Ic. Pl. As. Rar. t. 118 A; Spring, Monogr. Lycopod. 269; Seem. Fl. Viti. 331; Benth. Fl. Austral. vii. 681. *Lycopodium nudum*, Linn. Sp. Pl. 1564.

Bengal plain from the Soonderbun to the base of the Himalaya, common; and in the valleys of Nepaul, *ex Wallich*.—Distrib. South India, Malay Peninsula; and in the tropics of nearly the whole world.

Plentiful among the aerial roots near the base of the stems of coco-nut-trees at Calcutta, and on many other trees. I have never seen it except as an epiphyte.

52. *LYCOPODIUM*, Linn.

Stems branched dichotomously; leaves many, usually in some portion of the stem imbricated, quaquaversal or bifarious. Sporangia solitary in the axils of the leaves, or collected closely into quasi-catkins, the floral leaves reduced more or less bractiform; sporangia sessile, broadly lunate, 1-celled, dehiscent into 2 valves from the vertex. Spores, when young, collected in spheres of 3, each spore, when separated, being one third of a sphere cut out by two planes passing through a diameter.—Distrib. A cosmopolitan genus. Species 70 (as arranged by Baker).

* *Sporangia solitary in the axils of leaves that are not reduced, scattered often through a considerable length of the stems, but in L. squarrosum collected towards the ends of the stems more or less catkin-like. Leaves quaquaversal.*

1. *L. LUCIDULUM*, Michx. Fl. Bor.-Am. ii. 284. Stems erect, short, rigid; leaves $\frac{1}{4}$ in., linear-oblong, scarcely acute, subentire, sessile, hardly narrowed at all at the base, reflexed just above the base, shining, coriaceous.—Spring, Monogr. Lycopod. 37. *L. reflexum*, Schk. Krypt. Grev. t. 159.

Sikkim, alt. 8000-12,000 feet; Sinchul, Lachen, Yeumtong, Sir J. D. Hooker; Is-lumbo, Laghep; C. B. Clarke.

Stems 2-6 in., stout, the lower leaves much reflexed; sporanges not continued to the summits of the branches, where the barren leaves are strictly ascending. Midrib of the leaves obscure. Sporangia large. The high-level Sikkim plants are only $1\frac{1}{2}$ in., much slenderer, with smaller leaves.—I had erroneously identified the North-Indian plant with

L. vernicosum, Hk. & Grev., founded on South-Indian examples, which has more obtuse, more dense, and more coriaceous leaves.—Spring also says that Griffith found in Gorval and Boutan (see Monogr. Lycopod. 2nd pt. 16, 17) *L. ceylanicum*, Spring, which differs by having the leaves not reflexed.—Mr. Baker has lately revised *Lycopodium*, and finds that this Sikkim plant is identical with the American species, and differs from the South Indian; and I owe this correction to him.—Pl. LXXXIV. fig. 1.

2. *L. HAMILTONII*, Spreng.; Hk. & Grev. in Hook. Bot. Misc. ii. 366. Stems erect, short, rigid; leaves $\frac{1}{4}$ – $\frac{1}{3}$ in., oblong, obtuse, entire, sessile, narrowed much at the base, subpatent, often tortuous when dry, entire, thick, coriaceous, margin manifest reflexed.—Spring, Monogr. Lycopod. 2nd pt. 16, not of 1st pt. 35. *L. obtusifolium*, Ham. in Don, Prodr. Fl. Nep. 18; Wall. Cat. 134, not of Swartz.

Kumaon, alt. 4000 feet; *Strachey & Winterbottom*. Nepaul and Sikkim alt. 5000–7500 feet; *Wallich, C. B. Clarke*. Khasia; alt. 4000–5000 feet, frequent.—Distrib. Burma, Bombay.

Mr. Baker unites with this *L. aloifolium*, Wall. Cat. 129; Hk. & Grev. in Hook. Bot. Misc. ii. 367, Ic. Fil. t. 233; Spring, Monogr. Lycopod. 2nd pt. 15; Zenk. Pl. Ind. t. 12. *L. empetrifolium*, Dalz. in Hook. Journ. Bot. 1852, 113. This only differs by having the leaves sessile, hardly narrowed at the base. There is no difference in the nervation of the leaves. I do not know why Spring excludes Zenker's plate, which appears very good.

Var. *petiolata*. Leaves thinner in texture, narrower, longer petioled or subpetioled, less closely imbricate, margin less prominent, hardly recurved.

Khasia, alt. 4000 feet; frequent.—The extreme form of this, with its narrow, lax, loosely scattered leaves, appears distinct; but there are numerous intermediate states.

3. *L. SETACEUM*, Ham. in Don, Prodr. Fl. Nep. 18. Stems lax, often pendent or elongate; leaves $\frac{1}{4}$ – $\frac{1}{3}$ in., linear, acute, adpressed or patent, entire.—Spring, Monogr. Lycopod. 42. *L. pulcherrimum*, Wall. Cat. 115; Hk. & Grev. in Hook. Bot. Misc. ii. 367, Ic. Fil. t. 38. *L. subulifolium*, Wall. Cat. 114; Hk. & Grev. in Hook. Bot. Misc. ii. 367, Ic. Fil. t. 49. *L. gramineum*, Spring, Monogr. Lycopod. 2nd pt. 19.

From Kumaon to Bhotan, alt. 4000–8000 feet, common. Khasia, alt. 4000–6000 feet, common.—Distrib. South India, Columbia.

This species has two forms, viz. :—

Var. *subulifolia*, Wall. Leaves narrowly linear, green, lax, with no distinct midrib, in spreading plants patent, in pendent plants laxly adpressed.

Var. *pulcherrima*, Wall. Branches rather stiffer, leaves rather broader, with midrib distinct beneath, ascending, crispedly incurved when dry.

[*L. subulifolium*, Spring, Monogr. Lycopod. pt. ii. 19, should be done away with altogether. Wall. Cat. 114 is not Zenker's plant, nor has Zenker's plant been gathered in Nepaul. Probably Spring has been misled by the mixture in the distribution of Wallich's plants.]

4. *L. SERRATUM*, Thunb. Fl. Japon. 341, t. 38. Stems rigid, 3–10 in.; leaves $\frac{1}{2}$ –1 in., spatulate, oblong, subpetiolate, serrate.—Don, Prodr. Fl. Nep. 19; Wall. Cat. 118; Hk. & Grev. Ic. Fil. t. 37; Spring, Monogr. Lycopod. 39. *L. javanicum*, Swartz; Blume, Enum. Pl. Jav. Fil. 272; Swartz, Monogr. Lycopod. 40. *L. sulcinervium*, Spring, Monogr. Lycopod. 39.

Nepaul to Bhotan; alt. 5000–10,000 feet, frequent. Khasia, alt. 4000–6000 feet, common.—Distrib. Malaya, Ceylon, Polynesia, Japan.

5. *L. SQUARROSUM*, Forst. Prodr. Fl. Austral. 86. Stems usually 1–2 feet long, bearing sporanges only towards their extremities; leaves $\frac{1}{2}$ – $\frac{3}{4}$ in., narrowly lanceolate-linear, acute, entire, rigid; upper leaves supporting the sporanges suddenly narrowed above the short ovate base into a linear subulate point, thus always more or less bracteiform.—Blume, Enum. Pl. Jav. Fil. 265; Hk. & Grev. in Hook. Bot. Misc. ii. 369; Spring, Monogr. Lycopod. 52; Seem. Fl. Viti. 328; Baker, Fl. Mauritius, 519. *L. ulicifolium*, Ventenat; Spring, Monogr. Lycopod. 50. *L. Hookeri*, Wall. Cat. 116; Hk. & Grev. Ic. Fil. t. 185. *L. epiceæfolium*, Desv.; Spring, Monogr. Lycopod. 51. *L. protensum*, Hk. & Grev. in Hook. Bot. Misc. iii. 105. *L. verticillatum*, Willd.; Wall. Cat. 119; not of Linn. f. nor of Swartz.

Sikkim and Bhotan, alt. 1000–5000 feet, frequent. Khasia, alt. 500–4000 feet, frequent. Chittagong Hills, Hook. f. & T. Thoms.—Distrib. South India, Ceylon, Malay Peninsula and Islands, Polynesia, Mauritius, Madagascar.

The North-Indian plant is the typical *L. ulicifolium*, which has the leaves ascending, scarcely patent. *L. squarrosus* type has the leaves patent, squarrose. Large examples of *L. setaceum* and small examples of *L. squarrosus* are mounted together in the Kew Herbarium, and I can only separate them by the floral leaves of *L. ulicifolium* being more or less distinctly bracteiform. This distinction seems to fail us in *L. proliferum*, Blume, which is united by Baker with *L. squarrosus*. It seems midway between *L. squarrosus* and *L. setaceum*. On the other hand, my large *L. squarrosus* from Sikkim has the sporanges collected in dense short catkins, and might be equally well placed in the next series.

** *Sporangia collected in quasi-catkins, i. e. the spore-supporting leaves are closely packed in terminal oblong cones, and are dissimilar in form to the sterile stem-leaves. See also L. squarrosus above.*

† *Sterile leaves of the stem quaquaversal, arranged spirally.*

6. *L. CERNUUM*, Linn. Sp. Pl. 1566. Stem rigid, dendroid, 6–24 in., with the primary branches divaricate; leaves subulate, acute, not long-hair-pointed; catkins sessile, $\frac{1}{4}$ – $\frac{1}{2}$ by $\frac{1}{10}$ in. diam., ultimately pendent.—Roxb. in Calc. Journ. Nat. Hist. iv. 472; Wall. Cat. 130; Hk. & Grev. in Hook. Bot. Misc. ii. 369; Spring, Monogr. Lycopod. 79; K. Muell. in Bot. Zeit. 1861, 163; Seem. Fl. Viti. 328; Milde, Fil. Europ. 255; Benth. Fl. Austral. vii. 676. *L. curvatum*, Swartz; Spring, Monogr.

Lycopod. 61. *L. valonioides*, Blume, Enum. Pl. Jav. Fil. 266; Rumph. Herb. Amb. vi. t. 46. Fig. 1; Rheede, Hort. Mal. xii. t. 39.

East Bengal, common; from the sea to the mountains, ascending to 3000 feet alt.—
Distrib. Throughout the tropics of the globe.

Var. *sikkimensis*, (sp.) K. Muell. in Bot. Zeit. 1861, 164. Stem hairy; leaves hair-pointed.

Sikkim, Khasia, Chittagong.—Main stem with approximate imbricate leaves, mostly deflexed in the lower part of the stem.

7. *L. ANNOTINUM*, Linn. Sp. Pl. 1566. Stem elongate, procumbent; leaves linear, rigid, scarcely acute, midrib obscure, margin entire; catkins solitary, sessile or short-peduncled; bracts ovate-lanceolate, acute, scarcely hair-pointed, little serrate on the margin.—Schk. Krypt. Gew. t. 162; Engl. Bot. t. 1727; Hook. Brit. Ferns, t. 50; Spring, Monogr. Lycopod. 77; Milde, Fil. Europ. 252.

Sikkim; Lachen, alt. 11,000–14,000 feet, *J. D. Hooker*; Laghep, alt. 12,000 feet, *C. B. Clarke*.—Distrib. North Europe, Asia, and America.

The Sikkim plant differs from the Linnean type, in that the catkins are generally peduncled, the peduncles attaining $1\frac{1}{2}$ in.; the leaves are very entire. But as the peduncles never carry more than one catkin, it seems nearer *L. annotinum* than any form of *L. clavatum*, and has been placed with *L. annotinum*. Here also is arranged *L. Heyneanum*, Wall. Cat. 132, from Malabar, which seems very like the Sikkim *L. annotinum*.

8. *L. CLAVATUM*, Linn. Sp. Pl. 1564. Stem elongate procumbent; leaves rigid, linear, acute, often hair-pointed, midrib obscure, margin subentire; peduncles long, often carrying 2 (sometimes 2–8) catkins.—Schk. Krypt. Gew. t. 162; Engl. Bot. t. 224; Hook. Brit. Ferns, t. 49; Spring, Monogr. Lycopod. 77; Milde, Fil. Europ. 255; Benth. Fl. Austral. vii. 675. *L. divaricatum*, Wall. Cat. 131; Hk. & Grev. in Hook. Bot. Misc. ii. 377. *L. trichiatum*, Blume, Enum. Pl. Jav. Fil. 263.

From Gurwhal to Bhotan, alt. 5000–10,000 feet, very common. Khasia, alt. 4000–6000 feet, very common.—Distrib. South India, Ceylon, Malaya, Australia, Northern Asia, Europe and America, South Africa, Andes.

The leaves on the main stems are scattered, but usually imbricate, *i. e.* the point of one reaches as far as the base of the next. The Indian plant grows larger than the English; the peduncles sometimes are 12 in. long, with several catkins, each $2\frac{1}{2}$ –3 in. long.—The common Himalayan form has rigid incurved leaves, as on the Scotch mountains. In Khasia the leaves are often thin, spreading, the whole plant more slender: this is *L. divaricatum*, Wall. In this Khasia plant also the leaves have sometimes extremely long hair-points, and the examples then coincide with the Javan specimens of *L. trichiatum*, Blume.

9. *L. PHLEGMARIA*, Linn. Sp. Pl. 1564. Stems long, pendent from trees; leaves broad-lanceolate, often $\frac{1}{2}$ in. broad, entire; catkins long, slender, moniliform, repeatedly

Microcarpum; bracts very small.—Blume, Enum. Pl. Jav. Fil. 261; Wall. Cat. 183; Roxb. in Calc. Journ. Nat. Hist. iv. 471; Spring, Monogr. Lycopod. 62; Seem. Fl. Viti. 328; Benth. Fl. Austral. vii. 674. *L. myrtifolia*, Forst. Prodr. Fl. Austral. 52. *L. mirabile* and *caerulea*, Willd. Sp. Pl. v. 11.—Rumph. Herb. Amb. vi. t. 41. fig. 1; Rhoez, Hort. Mal. xii. 14.

Secunderbun. Nepaul, Sikkim, Assam, Khasia, in hot valleys, alt. 300-3500 feet; not common.—Distrib. South India, Ceylon, Malaya, Australia, Polynesia, Africa and its eastern islands.

Var. *numularifolia*, (sp.) Blume, Enum. Pl. Jav. Fil. 263. Leaves elliptic obtuse.—*L. rotundifolium*, Wall. Cat. 2183; Roxb. in Calc. Journ. Nat. Hist. iv. 473; Hk. & Grev. Ic. Fil. 212.

Malay Islands.—This is not, I believe, a North-Indian form; but Mr. Baker regards the whole of Spring's 9th section (containing *L. Phlegmaria* and allies) as but one species.

†† *Leaves of the stem and fertile branches quaquaversal, of the ultimate sterile branches decussate, so that these branches appear flattened.*

10. *L. COMPLANATUM*, Linn. Sp. Pl. 1567. Stems elongate; leaves of the ultimate barren branches 4-ranked, the two marginal ranks falcate oblong-linear, the dorsal and ventral ranks much smaller, straight, linear; peduncles long, with several straight catkins.—Schk. Krypt. Gew. t. 163; Hk. & Bauer, Gen. Fil. 117 A; Spring, Monogr. Lycopod. 101; Milde, Fil. Europ. 257. *L. thyoides*, Humb. & Bonpl.; Blume, Enum. Pl. Jav. Fil. 263. *L. sabinæfolium*, Willd.; Blume, Enum. Pl. Jav. Fil. 263; Spring, Monogr. Lycopod. 84.

Assam, Griffith. Khasia; Moflong, Griffith, J. D. Hooker, C. B. Clarke; Syung and Mumbree, J. D. Hooker.—Distrib. Java, Northern Europe, Asia and America.

Milde (Fil. Europ. 257) doubts whether the Deccan *L. Wightianum* (Wall. Cat. 2184, Spring, Monogr. Lycopod. 103) differs from *L. complanatum*. There is now good material of *L. Wightianum* collected; the leaves on the ultimate sterile branches are not of two forms, and they are only very obscurely 4-ranked: the plant seems nearer the Malabar *L. annotinum* above referred to.

11. *L. CASUARINOIDES*, Spring, Monogr. Lycopod. 94 and 2nd pt. 45. Stems elongate; leaves of the ultimate barren branches 2-ranked, narrow-oblong, closely adpressed, often with a hyaline or spreading hair-point; peduncles very short, bearing several curved catkins.—Hook. Ic. Pl. t. 968. *L. rubellum*, Presl, Bot. Bemerk. 153. *L. comans* and *filicaule*, Hook. f. Fl. Antaret. i. 112, in note.

Bhotan; Griffith. Khasia, alt. 4000-5000 feet; Mairung and Moflong, Griffith, Hook. f. & T. Thoms., C. B. Clarke.—Distrib. Malacca, Philippines.

Leaves on the main stem scattered, not imbricated, often hyaline. Plant rambling many feet; very red in Khasia. When not in fruit there is often no complanate foliage,

the leaves on the ultimate branchlets being irregularly spirally 3-5-stichous, falcate patent. The barren branches, above or near the peduncles, usually show adpressed 2-ranked leaves.

[The Indian plants placed in *Lycopodium*, sect. *Stipulatæ*, by Hk. & Grev. in Hook. Bot. Misc. ii. 378, as well as *L. divaricatum*, Hk. & Grev. l. c. 377, are *Selaginellas*, as are *Lycopodium miniatosporum*, *cæspitosum*, and *curvatum* of Dalzell, in Hook. Kew Journ. 1862, 114.]

53. EQUISETUM, Linn.

Stems erect, striated, articulated and sheathed at the nodes; branches verticillate, leafless. Spores under the heads of peltate stalked scales closely aggregated in terminal cones; spores spherical, functionally equivalent to those of ferns, but enveloped spirally by two linear spatulate hygrometric elaters.

1. *E. ARVENSE*, Linn. Sp. Pl. 1516. Fertile stems appearing before the barren, usually quite simple; cone peduncled, teeth of the sheath below the cone lanceolate-linear; barren stems with whorled branches usually narrowed upwards.—Schk. Krypt. Gew. t. 167; Engl. Bot. t. 2020; Hook. Brit. Ferns, t. 60; Duval-Jouve, Hist. Nat. Equiset. 242-244; Milde, Fil. Europ. 217, Monogr. Equiset. 218-239, tt. 1-3.

Kumaon; Pindari, alt. 12,000 feet, and Runkim, alt. 13,500 feet, *Strachey & Winterbottom*. Kashmir and Dras, *Dr. Henderson*.—Distrib. Europe, North and Central Asia, North America.

There are only 2 Himalayan examples of this at Kew; and Milde quotes one other.

2. *E. DIFFUSUM*, Don, Prodr. Fl. Nep. 19. Fertile and barren stems similar, branched; branches from the main stem at their base ascending; cones mostly peduncled, subsolitary (*i. e.* there is very rarely another cone adjacent on the same branch); teeth of the sheath below the cone lanceolate-linear caudate, grooved on their keel.—Milde, Fil. Europ. 226, Monogr. Equiset. 302-310, t. 11. *E. scoparium*, Wall. Cat. 398.

Himalaya, alt. 1000-7000 feet; from Gurwhal to Mishmee, very common. Khasia, alt. 1000-4000 feet; common.—Distrib. Moulmein.

This has much the general habit of *E. palustre*, Linn.; and Mettenius has named one of Griffith's Khasi plants *E. palustre*, which differs (*inter alia*) by the much less caudate teeth of the upper sheaths.

3. *E. DEBILE*, Wall. Cat. 397. Stem thick, hollow, weak, fertile and barren similar, branched; branches from the main stem at their base patent at right angles to it; cones short-peduncled and sessile, often several approximated, owing to fertile branches springing close below a cone; teeth of the sheath below the cone lanceolate-linear caudate, grooved on their keel, brittle deciduous, so that the older sheaths appear mostly truncate.—Roxb. in Calc. Journ. Nat. Hist. iv. 468, t. 26;

Milde, Fil. Europ. 239, Monogr. Equiset. 476-491, t. 26. *E. virgatum* and *laxum*, Blume, Enum. Pl. Jav. Fil. 274. *E. pallens*, Wall. Cat. 1037. *Hippochæte debilis*, Seem. Fl. Viti. 424.

Throughout North India, from the plain at Calcutta to the mountains, ascending to 6000 feet alt.; common.—Distrib. South India, Ceylon, Malaya, Polynesia.

4. *E. ELONGATUM*, Willd. Sp. Pl. v. 8. Fertile and barren stems similar, branched; branches from the main stem at their base ascending; cones sessile, usually solitary; teeth of the sheath below the cone triangular acute, hardly elongate or caudate, not grooved on their keel.—*E. ramosum*, Schk. Krypt. Gew. t. 172 b. *E. ramosissimum*, Desf.; Duval-Jouve, Hist. Nat. Equiset. 248-250; Milde, Fil. Europ. 234-238; Monogr. Equiset. 428-468, t. 24.

North-west Himalaya, alt. 3000-8000 feet, frequent; Kashmir, Baltistan; extending also to the plains of the North-west at Moradabad, *T. Thomson*.—Distrib. Malabar Mts., North and West Asia. Nearly the whole of Europe, Africa, and America.

[Milde, Monogr. Equiset. 543, says that he has *E. robustum*, A. Braun, from Lahore and from Pondicherry; but there are no Indian specimens in the Kew bundle of *E. robustum*.]

REDUCTION OF WALLICH'S HERBARIUM

as to the North-Indian Ferns.

1. *Actinostachys digitata* = *Schizæa digitata*, Swartz.
2. *Schizæa dichotoma* (not from North India).
3. *Grammitis procera* = *Gymnogramme fraxinea*, Bedd.
4. „ *caudata* = *Gymnogramme fraxinea*, Bedd.
5. „ *decurrens* = *Gymnogramme elliptica*, Baker.
6. „ *flavescens* = *Gymnogramme involuta*, Hook. (2nd sheet, with *Asplenium ensiforme* mixed.)
7. „ *acuminata* = *Gymnogramme involuta*, Hook.
8. „ *diversifolia* (not from North India).
9. „ *Hamiltoniana* = *Gymnogramme Hamiltoniana*, Hook.
10. „ *macrophylla* = *Gymnogramme involuta*, Hook.
11. „ *affinis* = *Gymnogramme fraxinea*, Bedd.
12. „ *vestita* = *Gymnogramme vestita*, Hook.
13. *Acrostichum hybridum* (not from North India).
14. „ *coriaceum* (not from North India).
15. „ *viscosum*, Swartz. Good.
16. „ *neriifolium* = *A. viscosum*, Swartz.
17. „ *marginatum* = *A. conforme*, Swartz.
18. „ *decurrens* (not from North India).
19. „ *alcicorne* (not from North India).
20. „ *fuciforme* (not from North India).

21. *Acrostichum punctulatum* (not from North India).
22. " *contaminans* = *A. crispatum*, *Wall.*, var.
23. " *triquetrum* = *Lomaria euphlebia*, *Kunze.*
24. " *crispatum*, *Wall.* Good.
25. " *flagelliferum*, *Wall.* Good.
26. " *costatum*, *Wall.* Good.
27. " *rigidum* (not from North India).
28. " *viviparum* = *A. appendiculatum*, *Willd.*
29. " *Hamiltonianum* = *A. appendiculatum*, *Willd.*
30. " *setosum* = *A. appendiculatum*, *Willd.*
31. " *aureum*, *Linn.* Good.
32. *Lomaria serpens* = *Acrostichum axillare*, *Cav.*
33. " *attenuata* (not from North India).
34. " *secunda* (not from North India).
35. " *limonifolia* (not from North India).
36. " *scandens* = *Acrostichum scandens.*
37. " *spondiæfolia* (not from North India).
38. " *aurea* = *Onychium auratum*, *Kaulf.*
39. " *caruifolia* = *Onychium auratum*, *Kaulf.*
40. *Antrophyum reticulatum*, *Kaulf.* Good?
41. " *Boryanum* (not from North India).
42. " *pumilum* (not from North India).
43. " *coriaceum*, *Wall.* Good.
44. *Hemionitis cordifolia* = *H. arifolia*, *Bedd.*
45. *Psilotum flaccidum* (not from North India).
46. " *triquetrum* = *Ps. nudum*, *Griseb.*
47. *Ophioglossum cordifolium* = *O. reticulatum*, *Linn.*
48. *Botrychium lanuginosum*, *Wall.*, = *B. virginianum*, *Swartz*, var.
49. " *subcarnosum*, *Wall.*, = *B. daucifolium*, *Hook.*
50. *Osmunda speciosa* = *O. regalis*, *Linn.*
51. " *Leschenaultii* = *O. regalis*, *Linn.*
52. " *monticola* = *O. Claytoniana*, *Linn.*
53. *Anemia flexuosa* (not from North India).
54. *Helminthostachys dulcis* = *H. zeylanica*, *Hk. & Bauer.*
55. *Pleopeltis incana* (not from North India).
56. *Blechnum glandulosum* (not from North India).
57. " *orientale*, *Linn.* Good.
58. *Woodwardia radicans*, *Swartz.* Good.
59. *Meniscium deltoideum*, *Wall.* Good.
60. " *longifrons* = *M. cuspidatum*, *Blume*, var.
61. " *triphyllum*, *Swartz.* Good.
62. " *erosum* = *M. triphyllum*, *Swartz.*
63. " *salicifolium* (not from North India).
64. *Dicksonia arborescens* (not from North India).
65. " *appendiculata*, *Wall.* Good.
66. *Cheilanthes mysorensis*, *Wall.* (not from North India). Good.
67. " *rupestris*, *Wall.*, = *Ch. tenuifolia*, *Swartz.*
68. " *micrantha*, *Wall.*, = *Ch. tenuifolia*, *Swartz.*
69. " *lucida*, *Wall.*, = *Onychium japonicum*, *Kunze.*
70. " *pallens* (not from North India).
71. " *dealbata* = *Ch. farinosa*, *Kaulf.*

MR. C. B. CLARKE ON THE FERNS OF NORTHERN INDIA.

Cheilanthes tomentosa = *Ch. rufa*, *Don.* (This sheet is without number, but named by Wallich's hand.)

72. „ *contigua* = *Onychium multisetum*, *F. Henderson.*
73. *Adiantum capillus-veneris*, *Linn.* Good.
74. „ *soboliferum* (not from North India). Good?
75. „ *vestitum* = *A. caudatum*, *Linn.*
76. „ *flagelliferum* = *A. caudatum*, *Linn.*
77. „ *lanulatum*, *Burm.* Good.
78. „ *ancinum* = *A. flabellulatum*, *Linn.*
79. „ *scabrum* (not from North India).
80. „ *reniforme* (not from North India).
81. „ *venustum*, *Don.* Good.
82. „ *rhizophorum* = *A. caudatum*, *Linn.* var.
83. *Ceratopteris thalictroides*, *Brongn.* Good.
84. *Pteris sinuata* = *Pt. incisa*, *Thunb.*
85. „ *hastata* (not from North India).
86. „ *varians* = *Cheilanthes varians*, *Hook.*
87. „ *mysaurensis* (not from North India). *Pellaea geraniifolia.*
88. „ *ludens*, *Wall.* Good.
89. „ *nitidula* = *Pellaea nitidula*, *Hk. & Baker.*
90. „ *cæspitosa* = *Cheilanthes varians*, *Hook.*
91. „ *digitata* = *P. pellucida*, *Presl*, var.
92. „ *polita* (not from North India). *Lindsaya.*
93. „ *angustata* = *Lindsaya ensifolia*, *Swartz.*
94. „ *scabripes* = *Pt. pellucida*, *Presl*, var.
95. „ *læta* = *Pt. cretica*, *Linn.*
96. „ *nervosa* = *Pt. pellucida*, *Presl*, var.
97. „ *semipinnata*, *Linn.* Good.
98. „ *lanuginosa* = *Pt. aquilina*, *Linn.*
99. „ *densa* = *Pt. aquilina*, *Linn.*
100. „ *firma* = *Pt. aquilina*, *Linn.*
101. „ *terminalis* = *Pt. excelsa*, *Gaud.*
102. „ *seminastata* = *Pt. aquilina*, *Linn.*
103. „ *lorigera* = *Pt. aquilina*, *Linn.*
104. „ *subquinata* = *Pt. quadriaurita*, *Retz.* var.
105. „ *linearis* (not from North India).
106. „ *nemoralis* = *Pt. biaurita*, *Linn.* (as to the type sheet).
107. „ *aspericaulis* = *Pt. quadriaurita*, *Retz.*
108. „ *longipinnula*, *Wall.* Good.
109. „ *umbrosa* = *Pt. Wallichiana*, *Ag.*
110. „ *subpedata* (not from North India).
111. „ *longifolia*, *Linn.* Good.
112. „ *amplectens* = *Pt. longifolia*, *Linn.*
113. „ *recurvata* = *Pt. aquilina*, *Linn.*
114. *Lycopodium subulifolium* = *L. setaceum*, *Ham.*
115. „ *pulcherrimum* = *L. setaceum*, *Ham.* var.
116. „ *Hookeri* = *L. squarrosum*, *Forst.*
117. „ *urostachyum* (not from North India).
118. „ *serratum*, *Thunb.* Good.
119. „ *verticillatum* = *D. squarrosum*, *Forst.*
120. „ *atroviride* = *Selaginella*, sp.
121. „ *concinnum* = *Selaginella*, sp.

172. *Hymenophyllum badium* = *H. polyanthos*, *Swartz*.
 173. " *serpens* = *H. javanicum*, *Spreng*.
 174. *Lygodium microphyllum*, *R. Br.* Good, except the first specimen of the type sheet, which is *L. flexuosum*, *Swartz*.
 175. " *longifolium* = *L. flexuosum*, *Swartz*.
 176. " *dichotomum* = *L. circinatum*, *Swartz*.
 177. " *polystachyum* (not from North India).
 178. *Cyathea spinulosa*, *Wall.* Good.
 179. " *Brunonia* (not from North India).
 180. " *venulosa* (not from North India).
 181. " *excelsa* (not from North India).
 182. " *robusta* (not from North India).
 183. *Sphaeropteris barbata* = *Peranema cyatheoides*, *Don*.
 184. *Matonia pectinata* (not from North India).
 185. *Lomaria Boryana* (not from North India).
 186. *Marattia fraxinea* (not from North India).
 187. *Angiopteris crassipes* = *A. evecta*, *Hoffm*.
 188. *Asplenium reticulatum* = *Allantodia javanica*, *Bedd*.
 189. " *planicaule* = *A. laciniatum*, *Don*, var.
 190. " *decurrens* = *A. unilaterale*, *Lamk*.
 191. " *Finlaysonianum* = *A. falcatum*, *Lamk*. var. (All the sheets.)
 192. " *urophyllum* (not from North India).
 193. " *Trichomanes*, *Linn.* Good.
 194. " *fraxinifolium* = *A. bantamense*, *Baker*.
 195. " *ovatum* (not from North India).
 196. " *Penangianum* (not from North India).
 197. " *radiatum* = *Actinopteris dichotoma*, *Bedd*.
 198. " *Nidus*, *Linn.* Good.
 199. " *subsinnuatum* = *A. lanceum*, *Thunb*.
 200. " *ensiforme*, *Wall.* Good.
 201. " *soboliferum* = *A. tomentosum*, *Hook*.
 202. " *proliferum* = *A. esculentum*, *Presl* (in the 2nd sheet *A. latifolium*, *Don*, is mixed).
 203. " *diversifolium* = *A. latifolium*, *Don*.
 204. " *porrectum* (not from North India).
 205. " *acuminatum* = *A. sylvaticum*, *Presl*.
 206. " *tenuifrons* = *A. Clarkei*, *Bedd*. (but *A. nigripes*, *Mett.*, is mixed on the type sheet).
 207. " *multijugum* = *A. normale*, *Don*.
 208. " *multicaule* = *A. normale*, *Don*.
 209. " *lætum* = *A. unilaterale*, *Lamk*.
 210. " *lobulosum* = *A. longifolium*, *Don*.
 211. " *cristatum* = *A. unilaterale*, *Lamk*.
 212. " *hirsutum* (not from North India).
 213. " *mysurense* (not from North India).
 214. " *pulchellum* = *A. nitidum*, *Swartz*.
 215. " *bullatum* = *A. bulbiferum*, *Forst*.
 216. " *concinnum* = *A. tenuifolium*, *Don*.
 217. " *cæspitosum* = *A. laciniatum*, *Don*.
 218. " *heterocarpum*, *Wall.* Good.
 219. " *flagelliferum* = *A. longissimum*, *Blume*.
 220. " *brevisorum*, *Wall.* Good.

221. *Asplenium alternans*, *Wall.* Good.
222. „ *auritum* (not from North India).
223. „ *oxyphyllum*, *Wall.* (not from North India).
224. „ *porrectum* (*lege polyodon*) (not from North India).
225. „ *falcatum*, *Lamk.* Good.
226. „ *pellucidum* (not from North India).
227. „ *nitens* (not from North India).
228. „ *parallelum* = *A. sorzogonense*, *Presl.*
229. „ *caudatum*, *Wall.* Good.
230. „ *polymorphum* = *A. latifolium*, *Don* (in the additional sheets *Gymnogramme opaca* is mixed).
231. „ *pectinatum* = *A. Filix-fœmina*, *Bernh.* (in the additional sheets *A. nigripes* is mixed).
232. „ *nitidum* (not from North India).
233. „ *Ruta*? = *A. varians*, *Hk. & Grev.*
234. „ *depauperatum* = *A. laciniatum*, *Don.*
235. „ *Prescottianum* (not from North India).
236. „ *proliferum* (not from North India).
237. „ *spectabile* = *A. multicaudatum*, *Wall.* (Second sheet is *Nephrodium Boryanum*, *Baker*, var.)
238. *Cænopteris furcata* (not from North India).
239. „ *vivipara* (not from North India).
240. *Davallia lonchitidea* = *D. platyphylla*, *Don.*
241. „ *lobulosa* (not from North India).
242. „ *angustata* (not from North India).
243. „ *flagellifera* (not from North India).
244. „ *villosa* = *D. marginalis*, *Hk. & Baker.*
245. „ *tenuifolia* = *D. chinensis*, *Swartz.*
246. „ *ornata* (not from North India).
247. „ *parvula* (not from North India).
248. „ *achilleæfolia* (not from North India).
249. „ *serræformis* (not from North India).
250. „ *pedata*, *Smith.* Good.
251. „ *parallela* (not from North India).
252. „ *coniifolia* (not from North India).
253. „ *elegans* (not from North India).
254. *Equisetum scirpioides*, *Herb. Ham.*, = *E. elongatum*, *Willd.*
255. „ *membranulosa*, *Wall.* Good.
256. „ *immersa*, *Wall.* Good.
257. „ *rhomboidea* = *D. polypodioides*, *Don*, var.
258. „ *bullata*, *Wall.* Good.
259. „ *chærophylla* = *D. pulchra*, *Don.*
260. „ *stipellata* = *D. nodosa*, *Hook.*
261. „ *pyramidata* = *D. flaccida*, *R. Br.* var.
262. „ *puberula* = *D. flaccida*, *R. Br.*
263. „ *pilosula* = *D. flaccida*, *R. Br.* var.
264. „ *virens* (not from North India).
265. *Polypodium costatum* = *P. stigmatum*, *Swartz.* (Second sheet is mainly *P. flocculosum*, *Don.*)
266. „ *porosum* = *P. fissum*, *Baker.*
267. „ *pertusum* = *P. adnascens*, *Swartz.*
268. „ *adnascens*, *Swartz.* Good.
269. „ *mysurensense* = *P. fissum*, *Baker.*

270. *Polypodium vittarioides* = *P. adnascens*, *Swartz*.
 271. „ *loriforme* = *P. lineare*, *Thunb.*
 272. „ *sphærocephalum* = *P. angustatum*, *Swartz*.
 273. „ *polyccephalum* = *P. punctatum*, *Swartz*.
 274. „ *longifrons* = *P. normale*, *Don*.
 275. „ *sesquipedale* = *P. lineare*, *Thunb.*
 276. „ *ovatum*, *Wall.* Good.
 277. „ *Mauritiaum* (not from North India).
 278. „ *furfuraceum* (not from North India).
 279. „ *gladiatum* (not from North India).
 280. „ *zosteræforme* (not from North India).
 281. „ *glabrum* = *P. punctatum*, *Swartz*.
 282. „ *grandifolium* = *P. membranaceum*, *Don*.
 283. „ *hymenodes* = *Acrostichum axillare*, *Cav.*
 284. „ *hemionitideum*, *Wall.* Good.
 285. „ *contiguum* = *P. lineare*, *Thunb.*
 286. „ *Horsfieldii* (not from North India). Good.
 287. „ *Wallichii*, *R. Br.* Good.
 288. „ *coronans*, *Wall.* Good.
 289. „ *alternifolium* = *P. nigrescens*, *Blume*. Var. *polyphylla* = *P. longifolium*,
Blume.
 290. „ *amœnum*, *Wall.* Good.
 291. „ *quercifolium*, *Linn.* Good. (Third sheet has *P. Linnæi* mixed.
 292. „ *curvinervium* (not from North India).
 293. „ *propinquum*, *Wall.* Good. (Third sheet is *P. ebenipes*, *Hook.*; fourth sheet
is *P. hastatum*, *Thunb.*)
 294. „ *oxylobum* = *P. hastatum*, *Thunb.* var.
 295. „ *dilatatum*, *Wall.* Good.
 296. „ *verrucosum* (not from North India).
 297. „ *glaucistipes* (not from North India).
 298. „ *caudigerum* = *Nephrodium cucullatum*, *Baker* (at least as to type sheet).
 299. „ *urophyllum*, *Wall.* Good.
 300. „ *lineatum*, *Colebr.* Good.
 301. „ *secundum* = *Nephrodium unitum*, *R. Br.*
 302. „ *scabridum* = *Nephrodium aridum*, *Baker*.
 303. „ *leiorrhizon*, *Wall.* Good. (Third sheet = *P. juglandifolium*, *Don.*)
 304. „ *Lindleyanum* (not from North India).
 305. „ *venustum*, *Wall.* Good.
 306. „ *capitellatum* = *P. juglandifolium*, *Don*.
 307. „ *neriifolium* (not from North India).
 308. „ *argutum*, *Wall.* Good.
 309. „ *elongatum* = *Nephrodium cuspidatum*, *Baker*.
 310. „ *lachnopus*, *Wall.* Good, *i. e.* as to the main part of the type sheet: the other
sheets are largely *P. microrrhizoma*, *C. B. Clarke*.
 311. „ *subpectinatum*, *Wall.* (not from North India).
 312. „ *proliferum*, *Roxb.* Good.
 313. „ *serra* (not from North India).
 314. „ *auriculatum*, *Wall.* Good.
 315. „ *tridactylon*, *Wall.*, = *P. pteropus*, *Blume*.
 316. „ *longipes*, *Wall.*, = *P. distans*, *Don*.
 317. „ *nemorale*, *Wall.*, = *Nephrodium parasiticum*, *C. B. Clarke*.
 318. „ *marginale*, *Wall.* (not from North India). *Alsophila*, sp.

319. *Polypodium comosum* (not from North India). *Alsophila*, sp.
 320. „ *contaminans* = *Alsophila glauca*, *J. Smith*.
 321. „ *giganteum* = *Alsophila glabra*, *Hook*.
 322. „ *marginale*. Type sheet contains *Nephrodium pulvinuliferum*, *Baker*, with a small piece of *P. punctatum*, *Swartz*: 2nd sheet is *Nephrodium scabrosum*, *Baker*, but is ticketed as from Nepal.
 323. „ *Leschenaultianum* (not from North India). *Alsophila*.
 324. „ *oxyphyllum* = *Asplenium oxyphyllum*, *Hook*.
 325. „ *confluens* (not from North India).
 326. „ *coniifolium* = *P. subdigitatum*, *Blume*.
 327. „ *ornatum*, *Wall*. Good.
 328. „ *adnatum* = *P. distans*, *Don*.
 329. „ *alternans* (not from North India). *Alsophila*.
 330. „ *erubescens*, *Wall*. Good.
 331. „ *phymatodes*, *Linn*. (not from North India). Good.
 332. „ *molliusculum* = *Nephrodium parasiticum*, *C. B. Clarke*.
 333. „ *brunneum* = *P. distans*, *Don*, var.
 334. „ *dentigerum* = *Asplenium Filix-fœmina*, *Bernh.* var.
 335. „ *tenericaule* = *Nephrodium tenericaule*, *Hook*.
 336. „ *umbrosum* (not from North India). *Alsophila*.
 337. *Aspidium pilosulum* = *Nephrodium crenatum*, *C. B. Clarke*.
 338. „ *puberum* = *Nephrodium falcilobum*, *Hook*. var.
 339. „ *fimbriatum* = *Asplenium fimbriatum*, *Hook*. var.
 340. „ *patentissimum* = *Nephrodium Filix-Mas*, *Richd.* var.
 341. „ *coniifolium* = *A. aristatum*, *Swartz*.
 342. „ *eriocarpum* = *Nephrodium crenatum*, *C. B. Clarke*.
 343. „ *subdiaphanum* = *Nephrodium crenatum*, *C. B. Clarke*.
 344. „ *Brunonianum* = *Nephrodium Brunonianum*, *Hook*.
 345. „ *apiciflorum* = *Nephrodium apiciflorum*, *Hook*.
 346. „ *multidentatum* = *Davallia multidentata*, *Baker*.
 347. „ *glanduliferum* = *Nephrodium prolixum*, *Baker*.
 348. „ *multijugum* = *Nephrodium multijugum*, *C. B. Clarke*, not of *Baker*.
 349. „ *appendiculatum* = *Nephrodium canum*, *Baker*. (The other sheets have some *Polypodium erubescens*, *Wall.*, intermixed.)
 350. „ *solutum* = *Nephrodium parasiticum*, *C. B. Clarke*.
 351. „ *ciliatum* = *Nephrodium ciliatum*, *C. B. Clarke*.
 352. „ *venulosum* = *Nephrodium aridum*, *Baker*.
 353. „ *multilineatum* = *Nephrodium truncatum*, *Presl*.
 354. „ *canescens* = *Nephrodium parasiticum*, *C. B. Clarke*.
 355. „ *prionophyllum* = *Nephrodium truncatum*, *Presl*.
 356. „ *squarrosus* = *Asplenium macrocarpum*, *Blume*.
 357. „ *crinitum* (not from North India).
 358. „ *unitum* = *Nephrodium cucullatum*, *Baker*.
 359. „ *foliolosum* = *Davallia nodosa*, *Hook*.
 360. „ *ocellatum* = *A. auriculatum*, *Swartz*, var.
 361. „ *fuscipes*, *Wall.*, = *Nephrodium sagenioides*, *Baker* (type sheet), but nearly all the rest is *Nephrodium membranifolium*, *Presl*.
 362. „ *riparium* (not from North India).
 363. „ *Prescottianum*, *Wall*. Good.
 364. „ *rhomboideum* = *A. amabile*, *Blume*.
 365. „ *sublanosum* = *Nephrolepis exaltata*, *Schott*.
 366. „ *marginatum* = *A. auriculatum*, *Swartz*, var.

367. *Aspidium ocapitum* = *A. auriculatum*, *Swartz*, var.
 368. „ *pungens* = *A. ilicifolium*, *Don*.
 369. „ *rufo-barbatum* = *A. aculeatum*, *Swartz*, var.
 370. „ *affine* = *A. aculeatum*, *Swartz*, var. (In the 3rd sheet *Nephrodium Filix-Mas*, var., is mixed.)
 371. „ *setosum* = *A. aculeatum*, *Swartz*.
 372. „ *spectabile* = *Nephrodium spectabile*, *C. B. Clarke*.
 373. „ *Wallichianum* = *Oleandra Wallichii*, *Hook*.
 374. „ *Singaporianum* (not from North India).
 375. „ *articulatum* (not from North India).
 376. „ *caryotideum* = *A. falcatum*, *Swartz*.
 377. „ *coadunatum* = *Nephrodium cicutarium*, *Baker*. (In the later sheets *Nephrodium membranifolium*, *Presl*, is mixed.)
 [377. „ *multicaudatum* = *Nephrodium multicaudatum*, *C. B. Clarke*.]
 378. „ *alatum* = *Nephrodium vastum*, *Baker*.
 379. „ *variolosum* = *Nephrodium variolosum*, *Baker*.
 380. „ *atratum* = *Nephrodium hirtipes*, *Hook*. var.
 381. „ *caducum*, *Wall*. Good.
 382. „ *polymorphum* = *Nephrodium polymorphum*, *Baker*.
 383. „ *rostratum* = *Nephrodium polymorphum*, *Baker*.
 384. „ *aduncum*. Blank sheet.
 385. „ *Telfairianum* (not from North India).
 386. „ *terminans*. Blank sheet.
 387. „ *canum* = *Nephrodium ciliatum*, *C. B. Clarke*.
 388. „ *semi-bipinnatum*. Blank sheet.
 389. „ *eburneum* = *Nephrodium canum*, *Baker* (as to type specimen; the other specimen on the first sheet is *Asplenium oxyphyllum*, *Hook*.; the second sheet is *Asplenium macrocarpum*, *Blume*).
 390. „ *densum* = *Nephrodium sparsum*, *Don*, var.
 391. „ *marginatum*, *Wall.*, = *Asplenium bellum*, *C. B. Clarke* (as to type sheet).
 392. „ *nitidulum* = *Nephrodium sparsum*, *Don*, var.
 393. „ *divisum* = *Nephrodium Boryanum*, *Baker*.
 394. „ *tectum* (not from North India).
 395. *Arthrobotrys macrocarpa* = *Nephrodium cochleatum*, *Don*.
 396. *Cryptogramme Brunoniana* = *C. crispa*, *R. Br*.
 397. *Equisetum debile*, *Roxb*. Good.
 398. „ *scoparium* = *E. diffusum*, *Don*.
 775. *Sphæropteris Hookeriana* = *Diacalpe aspidioides*, *Blume*.
 776. *Grammitis Finlaysoniana* = *Gymnogramme elliptica*, *Baker*.
 1031. *Aspidium exaltatum* = *Nephrolepis exaltata*, *Schott*.
 Var. = *Nephrolepis volubilis*, *J. Smith*.
 1032. „ *Tavoyanum* = *Nephrolepis cordifolia*, *Hk. & Baker*.
 1033. *Acrostichum virens*, *Wall.*, replaced by *Equisetum panonicum* = *E. diffusum*, *Don*.
 1034. *Arthrobotrys avana* = *Nephrodium cochleatum*, *Don*.
 1035. *Asplenium Tavoyanum* = *A. falcatum*, *Lamk*.
 1036. „ *Grevilleanum* (not from North India).
 1037. *Equisetum pallens* = *Equisetum debile*, *Roxb*.
 2162. *Acrostichum Finlaysonianum*, *Wall*. Blank sheet.
 2163. „ *Wightianum* = *A. appendiculatum*, *Willd*.
 2164. „ *vestitum* (not from North India).
 2165. „ *rivulare*. Blank sheet.
 2166. „ *contractum*. Blank sheet.

2167. *Acrostichum stelligerum*. Blank sheet.
 2168. „ *terminans* = *A. virens*, *Wall.*
 2169. *Lomaria Wightiana*, *Wall.* Blank sheet.
 2170. *Hemionitis hastata* = *H. arifolia*, *Bedd.*
 2171. *Ophioglossum reticulatum*, *Herb. Ham.* Not found.
 2172. *Blechnum Finlaysonianum*, *Wall.* Blank sheet.
 2173. *Dicksonia scabra*, *Wall.* Good.
 2174. „ *moluccana*, *Roxb.* Blank sheet.
 2175. *Cheilanthes rigidula*, *Wall.*, = *Ch. farinosa*, *Kaulf.*
 2176. *Adiantum hirsutum*, *Willd.* Blank sheet.
 2177. „ *flabellulatum* = *A. hispidulum*, *Swartz.*
 2178. *Pteris Wightiana* = *Pt. aquilina*, *Linn.*
 2179. „ *arguta*, *Ham.* Blank sheet.
 2180. „ *geminata* = *Pt. biaurita*, *Linn.* var.
 2181. „ *ensiformis*, *Ham.* Blank sheet.
 2182. „ *alternifolia* (not from North India).
 2183. *Lycopodium rotundifolium*. Blank sheet.
 2184. „ *Wightianum* (not from North India).
 2185. „ *laevigatum*. Blank sheet.
 2186. „ *complanatum*. *Selaginella*, sp.
 2187. „ *ornithopodioides*. *Selaginella*, sp.
 2188. „ *bryopteris*. *Selaginella*, sp.
 2189. „ *circinale*. *Selaginella*, sp.
 2190. *Lonchitis hirsuta* (not from North India).
 2191. *Vittaria divergens*, *Roxb.* Blank sheet.
 2192. *Lindsaya attenuata*, *Wall.*, in *Herb. Finlayson*, therefore not from North India. (N.B. Not the same as *L. attenuata*, *Wall. Cat.* 151).
 2193. „ *pteroides*, *Wall.*, = *L. ensifolia*, *Swartz.*
 2194. „ *longipinna*, *Wall.*, = *L. ensifolia*, *Swartz.*
 2195. „ *interrupta*, *Roxb.*, sub *Vittaria*. Blank sheet.
 2196. „ *parasitica*, *Roxb.*, sub *Vittaria*. Blank sheet.
 2197. „ *Finlaysoniana*, *Wall.* No locality (not from North India).
 2198. *Hymenophyllum laeve*, *Ham.* (not from North India).
 2199. *Trichomanes campanulatum*, *Roxb.* No locality.
 2200. *Lygodium pubescens*, *Wall.*, = *L. flexuosum*, *Swartz.*
 2201. „ *japonicum*, *Swartz.* Good.
 2202. „ *Finlaysonianum* = *L. japonicum*, *Swartz.*
 2203. *Asplenium procerum*, *Wall.* Good.
 2204. „ *divaricatum*, *Wall.* Blank sheet.
 2205. „ *foliolosum*, *Wall.* Blank sheet.
 2206. „ *furcatum* (not from North India).
 2207. „ *parvulum*, *Wall.* Blank sheet.
 2208. „ *decussatum*, *Wall.*, = *A. japonicum*, *Thunb.*
 2209. „ *marginatum* = *A. Stoliczkae*, *C. B. Clarke*, the other part of the type sheet being *A. porrectum*, *Wall.*
 2210. „ *contaminans*, *Wall.* Blank sheet.
 2211. „ *pulchrum* (not from North India).
 2212. „ *puberulum* = *A. esculentum*, *Presl.*
 2213. „ *trapeziforme*, *Roxb.* Blank sheet.
 2214. „ *cultratum*, *Roxb.* Blank sheet.
 2215. „ *Wightianum* (not from North India).
 2216. „ *odontophyllum* (not from North India).

2217. *Asplenium obliquum*, *Swartz.* Blank sheet.
 2218. *Davallia Roxburghii*, *Wall.*, = *D. polypodioides*, *Don*, var.
 2219. „ *moluccana*, *Roxb.* Blank sheet.
 2220. „ *caudata* (not from North India).
 2221. *Polypodium Finlaysonianum*, *Wall.* Blank sheet.
 2222. „ *Wightianum*, *Wall.*, = *P. lineare*, *Thunb.*
 2223. „ *adhaerens*, *Wall.* Blank sheet.
 2224. „ *irioides*, *Ham.* Blank sheet.
 2225. „ *scabrum*, *Roxb.* Blank sheet.
 2226. „ *arboreum*, *Roxb.* Blank sheet.
 2227. „ *subarboreum*, *Ham.* Blank sheet.
 2228. „ *venosum*, *Ham.* Blank sheet.
 2229. „ *semi-bipinnatum*, *Wall.* (not from North India).
 2230. „ *aycefolium* (?), *Wall.* (not from North India).
 2231. „ *sinuosum*, *Wall.* (not from North India).
 2232. *Aspidium Hamiltonianum*, *Wall.* Blank sheet.
 2233. „ *auriculatum* = *Nephrolepis cordifolia*, *Hk. & Baker* (chiefly).
 2234. „ *flagelliferum*, *Roxb.* Blank sheet.
 2235. „ *Finlaysonianum* (not from North India).
 2236. „ *trifoliatum* (not from North India).
 2237. „ *coriaceum* (not from North India).
 2238. „ *sophoroides* (*Roxb.*). Blank sheet.
 2239. „ *parasiticum*, *Herb. Madr.* Blank sheet.
 2240. „ *hirsutulum*, *Ham.* Blank sheet.
 2241. „ *splendens*, *Ham.* (not from North India).
 2680. *Pteris Grevilleana*, *Wall.* Good.
 2681. „ *multidentata* = *Pt. ensiformis*, *Burm.*
 2682. *Asplenium Hookerianum* = *A. Finlaysonianum*, *Hook.* (not of *Wall. Cat.*, 191).
 2683. *Davallia urophylla* = *D. marginalis*, *Baker*, var.
 2684. „ *Hookeriana*, *Wall.* Good.
 2685. *Acrostichum ludens* = *A. appendiculatum*, *Willd.*
 4727. *Polypodium acutissimum* = *P. lineare*, *Thunb.*
 5169. „ *Grevilleanum* = *P. lineare*, *Thunb.*
 7073. *Alsophila Brunoniana*, *Wall.* The blank sheet has been filled up by pieces of fronds
 “taken from the specimen on the staircase,” supposed (as I think erroneously) to have been Wallich’s plant.
 7074. „ *glaucescens* = *A. glauca*, *J. Smith.*
 7075. „ *Grevilleana* = *Davallia flaccida*, *R. Br.* var.
 7076. *Cyathea bipinnata*, *Roxb.* No locality (not from North India).
 7077. *Polypodium Russelianum* = *Nephrodium tenericaule*, *Hook.*
 7078. „ *pubigerum* = *Nephrodium Leuzeanum*, *Hook.*
 7079. „ *polyodon* = *Aspidium caducum*, *Wall.*
 7080. „ *oppositum* = *Nephrodium sparsum*, *Don.*
 7081. „ *sophoroides* (not from North India).
 7082. *Aspidium parasiticum* = *Nephrodium parasiticum*, *C. B. Clarke.*
 7083. „ *hirsutulum* = *Nephrodium falcilobum*, *Hook.* (Another Mauritius fern is, however, mixed on the type sheet.)
 7084. *Hymenophyllum tenue*, *Ham.* (not from North India).
 7085. *Pteris ensiformis*, *Ham.*, = *Pt. ensiformis*, *Burm.*
 7086. „ *scabra* (not from North India).

7087. *Lycopodium pulvinatum*. *Selaginella*, sp.
 7088. „ *verticillatum* = *L. squarrosum*, *Forst.*
 7089. „ *pallidum*. *Selaginella*, sp.
 7090. *Asplenium Hookerianum*, *Wall.*, = *A. bantamense*, *Blume.*
 7091. „ *pellucidum* (not from North India).

DISTRIBUTION OF THE GENERA OF THE FERNS OF NORTH INDIA.

	Total species within the area.	Himalaya West of Nepal.	Himalaya East of Nepal.	From Assam to Chittagong.	Plains.	Peculiar to Northern India.		Total species within the area.	Himalaya West of Nepal.	Himalaya East of Nepal.	From Assam to Chittagong.	Plains.	Peculiar to Northern India.
<i>Gleichenia</i>	2	1	2	2	0	0	<i>Nephrodium</i>						
<i>Cyathea</i>	1	0	0	1	0	1	<i>Pleocnemia</i>	3	0	3	2	1	1
<i>Hemitelia</i>	2	0	2	2	0	1	<i>Sagenia</i>	9	2	4	7	2	1
<i>Alsophila</i>	6	0	6	5	0	3	<i>Nephrolepis</i>	4	1	1	4	0	0
<i>Diacalpe</i>	2	0	2	1	0	1	<i>Oleandra</i>	3	1	2	3	0	0
<i>Onoclea</i>	1	0	1	1	0	0	<i>Polypodium</i>						
<i>Woodsia</i>	3	3	2	0	0	2	<i>Phegopteris</i>	11	7	9	6	0	2
<i>Peranema</i>	1	0	1	1	0	0	<i>Goniopteris</i>	4	3	2	2	2	0
<i>Dicksonia</i>	4	2	4	2	0	2	<i>Dietyopteris</i>	1	0	0	1	0	1
<i>Hymenophyllum</i>	6	3	6	5	0	2	<i>Eupolypodium</i>	3	1	2	2	0	2
<i>Trichomanes</i>	7	1	4	6	0	0	<i>Goniophlebium</i>	7	4	6	3	0	6
<i>Davallia</i>	18	7	15	15	2	3	<i>Nipholobolus</i>	9	4	7	7	0	4
<i>Cystopteris</i>	2	1	2	0	0	0	<i>Dipteris</i>	1	0	0	1	0	0
<i>Lindsaya</i>	4	0	3	4	0	0	<i>Drynaria</i>	4	2	2	2	1	1
<i>Adiantum</i>	6	5	5	4	2	0	<i>Phymatodes</i>	23	6	17	16	2	8
<i>Cheilanthes</i>	9	6	3	5	3	2	<i>Pleopeltis</i>	4	1	4	2	0	1
<i>Onychium</i>	2	1	2	2	1	0	<i>Notholaena</i>	1	1	1	0	0	0
<i>Cryptogramme</i>	1	1	1	0	0	0	<i>Gymnogramme</i>	12	6	8	10	0	3
<i>Pellaea</i>	4	3	1	0	0	2	<i>Brainea</i>	1	0	0	1	0	0
<i>Pteris</i>	17	7	12	15	6	4	<i>Meniscium</i>	1	1	3	3	0	1
<i>Ceratopteris</i>	1	1	1	1	1	0	<i>Antrophyum</i>	4	0	4	3	0	0
<i>Lomaria</i>	4	0	2	4	0	0	<i>Vittaria</i>	3	1	2	2	1	1
<i>Blechnum</i>	3	0	2	2	0	1	<i>Tenitis</i>	0	0	0	1	0	0
<i>Woodwardia</i>	1	1	1	1	0	0	<i>Drymoglossum</i>	2	0	1	2	1	1
<i>Asplenium</i>							<i>Hemionitis</i>	2	0	0	2	1	0
<i>Nidus</i>	1	0	1	1	0	0	<i>Acrostichum</i>	15	1	9	13	3	3
<i>Euasplenium</i>	24	14	12	11	2	2	<i>Osmunda</i>	2	2	1	2	0	0
<i>Darea</i>	1	0	1	1	0	0	<i>Schizaea</i>	1	0	0	1	0	0
<i>Athyrium</i>	12	6	11	4	2	2	<i>Lygodium</i>	4	2	2	4	3	0
<i>Pseud-Allantodia</i> ..	2	1	2	2	0	2	<i>Angiopteris</i>	1	0	1	1	0	0
<i>Diplazium</i>	13	3	9	8	0	4	<i>Kaulfussia</i>	1	0	0	1	0	0
<i>Anisogonium</i>	2	0	1	0	1	0	<i>Ophioglossum</i>	3	2	2	1	0	0
<i>Hemidictyum</i>	2	1	1	1	0	0	<i>Helminthostachys</i>	1	0	0	1	1	0
<i>Allantodia</i>	1	0	1	1	0	0	<i>Botrychium</i>	3	2	3	1	0	0
<i>Actinopteris</i>	1	1	0	0	1	0	<i>Ptilotum</i>	1	0	0	0	1	0
<i>Aspidium</i>	12	9	11	6	1	6	<i>Lycopodium</i>	11	3	10	9	2	0
<i>Nephrodium</i>							<i>Equisetum</i>	4	4	2	2	2	0
<i>Lastrea</i>	30	12	26	16	2	11							
<i>Eunephrodium</i>	12	2	5	10	5	1	Total	379	149	269	258	52	88

EXPLANATION OF THE PLATES.

PLATE XLIX.

- Fig. 1. *Cyathea spinulosa*, Wall., drawn from Wallich's own example n. 178 of his Catalogue.—A. Barren secondary pinna, nat. size. B. Fertile secondary pinna, nat. size.
 2. *Hymenophyllum denticulatum*, Swartz, drawn from a Khasi example.—B. Two entire fronds on one rhizome, nat. size, seen from above. A. One pinna, magn. 5 diam., seen from beneath.
 Fig. 3. *Hymenophyllum Leviatii*, C. B. Clarke, drawn from a Yoksun example.—A. One frond, nat. size. B. Barren lobe of pinna, magn. 20 diam., seen from beneath. C. Fertile lobe of pinna, magn. 20 diam., seen from beneath.
 Fig. 4. *Davallia pulchra*, Don, var. *pseudocystopteris*, (sp.) Kunze, from a North-west Himalayan example; extremity of an ultimate pinna, magn. 8 diam., showing the very thin indusia of large oblong cells.

PLATE L.

Davallia wrophylla, Hook. (not Wall.), from Griffith's Bhotan example; one lower pinna, nat. size.

PLATE LI.

Cheilanthes farinosa, Kaulf., var. *Dalhousiae*, (sp.) Hook., from North-west Himalayan examples. A. an entire frond from a small specimen, and B. the lowest pinna of a frond from a larger specimen, both nat. size. C. Scale from the stipe, magn. 8 diam.

PLATE LII.

Cheilanthes albo-marginata, C. B. Clarke, from a Kashmir example.—A. A whole plant, nat. size. B. Scale from the stipe, magn. 8 diam.

PLATE LIII.

Pteris quadriaurita, Retz., var. *Khasiana*, from a Walong example.—A. The lowest pinna of a frond, nat. size. (The entire lanceolate-linear irregular reduced secondary pinna at the base of the pinna in this example has been faithfully added by the artist; it was accidentally present here, but in none of the other examples.) B. A basal secondary pinna, nat. size.

PLATE LIV.

Pteris Grevilleana, Wall., from Keenan's Cachar example; one barren and one fertile frond on the same rhizome, nat. size.

PLATE LV.

Pteris quadriaurita, Retz., var. *Blumeana*, (sp.) Agardh, from a Chittagong example; one basal (bipartite) pinna, nat. size.

PLATE LVI.

Fig. 1. *Pteris subindivisa*, C. B. Clarke, from a Teesta (Sikkim) example; a rhizome with one frond and part of another, nat. size. (The basal pinnae are sometimes much shorter than in this fully-developed specimen, or obsolete.)

Fig. 2. *Asplenium peginense*, Hance, from Levinge's Kashmir example; rhizome with one frond, nat. size.

PLATE LVII.

Asplenium Atkinsosi, C. B. Clarke, var. *Andersoni*, from a Tonglo (Sikkim) example; one basal pinna of a frond, nat. size.

PLATE LVIII.

Asplenium Filix-femina, Bernh., var. *pectinata*, (sp. Wall.), from a Sikkim example; the middle of a frond (5 pairs of pinnæ), nat. size. On the side is sketched (on a reduced scale), in outline, the frond from which the larger figure of the Plate was drawn.

PLATE LIX.

Fig. 1. *Asplenium Filix-femina*, Bernh., var. *attenuata*, C. B. Clarke, from a Kashmir example; one frond, nat. size.

Fig. 2. *Asplenium Filix-femina*, Bernh., var. *retusa*, (sp.) Decne., subvar. *rubicaulis*, Edgw., from a North-west Himalayan example; the greater part of one frond, nat. size.

PLATE LX.

Asplenium Filix-femina, Bernh., var. *flabellulata*, C. B. Clarke, from a Sikkim example; the lower half of a frond (5 pairs of pinnæ), nat. size.

PLATE LXI.

Fig. 1. *Asplenium Filix-femina*, Bernh., var. *polyspora*, C. B. Clarke, from a Chumba example; the greater part of a frond, nat. size.

Fig. 2. *Asplenium Filix-femina*, Bernh., var. *Parasnathensis*, C. B. Clarke, from a Parasnath example; a frond, nat. size.

PLATE LXII.

Fig. 1. *Asplenium fimbriatum*, Hook., var. *sphaeropteroides*, C. B. Clarke, from a Sikkim example; the greater part of a frond, nat. size.

Fig. 2. *Asplenium fimbriatum*, Hook., var. *foliolosa*, (sp. Wall.), from a Sikkim example; nearly half a frond, nat. size.

PLATE LXIII.

Fig. 1. *Asplenium procerum*, Wall., from a Sikkim example; basal part of one pinna, nat. size.

Fig. 2. *Asplenium bellum*, C. B. Clarke, from a Sikkim example; basal part of one pinna, nat. size.

PLATE LXIV.

Fig. 1. *Asplenium Japonicum*, Thunb., var. *chattagramica*, C. B. Clarke, from a Chittagong example; basal pinna of the frond, nat. size.

Fig. 2. *Asplenium torrentium*, C. B. Clarke, from a Sikkim large example; basal pinna of the frond, nat. size.

Fig. 3. *Asplenium torrentium*, C. B. Clarke, from a Sikkim small example; basal pinna of the frond, nat. size.

Fig. 4. *Asplenium succulentum*, C. B. Clarke, from a Sikkim example; basal portion of a pinna, showing the whole of the lowest secondary pinna, nat. size.

PLATE LXV.

Fig. 1. *Asplenium striatum*, C. B. Clarke, from Hooker's Sikkim example; basal portion of the lowest pinna of the frond, nat. size.

Fig. 2. *Nephrodium gracilescens*, Hook., var. *decipiens*, C. B. Clarke, from a Sikkim example; a frond, nat. size.—A. One segment of a pinna, magn. 8 diam., showing the divided venules.

PLATE LXVI.

Aspidium Prescottianum, Wall., var. *Bakerianum*, (sp. W. S. Atkinson), from a Sikkim example.—
b. A portion of the centre of a frond, nat. size. a. The whole of the same frond, $\frac{1}{2}$ nat. size, in outline, to show the proportion between length and breadth of the frond, and the non-attenuation of the base; the cutting of the pinnae not shown.

PLATE LXVII.

Fig. 1. *Nephrodium gracilescens*, Hook., var. *hirsutipes*, from a Khasi example.—s. Base of a frond, nat. size. b. Two segments of a pinna, magn. 4 diam., showing the hairy involucres.

Fig. 2. *Nephrodium gracilescens*, Hook., var. *didymochlaenoides*.—c. Base of a frond, nat. size. d. Two segments of a pinna, magn. 8 diam., showing the elliptic involucres.

PLATE LXVIII.

Fig. 1. *Nephrodium Filix-mas*, Richd., var. *panda*, C. B. Clarke, from a Chumbā example; basal portion of a frond, nat. size.

Fig. 2. *Nephrodium Filix-mas*, Richd., var. *normalis*, C. B. Clarke, from a Khasi example; a frond, nat. size.

PLATE LXIX.

Fig. 1. *Nephrodium Filix-mas*, Richd., var. *Khasiana*, C. B. Clarke, from a Khasi example; lower portion of a frond, nat. size.

Fig. 2. *Nephrodium Filix-mas*, Richd., var. *Schimperiana*, C. B. Clarke, from a Sikkim example; lower portion of a frond, nat. size.

PLATE LXX.

Nephrodium Filix-mas, Richd., var. *fibrillosa*, C. B. Clarke, from the North-west Himalaya; a frond, nat. size.

PLATE LXXI.

Nephrodium Filix-mas, Richd., var. *marginata*, sp. Wall., from a Sikkim example; basal portion of the lowest pinna of a frond, nat. size.

PLATE LXXII.

Nephrodium rhodolepis, C. B. Clarke, from a Sikkim example; basal portion of the lowest pinna of a frond, nat. size.

PLATE LXXIII.

Nephrodium ingens, W. S. Atkinson, from a Sikkim example; fragment from the base of a frond, nat. size. The lowest pinna (A) is fertile; the next (B), and all the superior pinnae, barren.

PLATE LXXIV.

Fig. 1. *Nephrodium glandulosum*, Hook., from Blume's Java example of *Aspidium glandulosum*, Blume; basal portion of a frond, nat. size.

Fig. 2. *Nephrodium glandulosum*, Hook., var. *late-strigosa*, C. B. Clarke, from a Chittagong example; basal portion of a frond, nat. size.

PLATE LXXV.

Nephrodium membranifolium, Presl.—A. Var. *typica*, from Chittagong; a fruiting (small) frond, nat. size. B, C. Var. *dimorpha*, from Sylhet; *b*, basal pinna of a barren frond, nat. size; *c*, basal portion of a fertile frond, nat. size.

PLATE LXXVI.

Nephrodium Wightii, C. B. Clarke, from Wight's Deccan examples. The barren and fertile fronds depicted (nat. size) have been pasted down on one sheet, and I do not doubt were collected by Wight as of one fern.

PLATE LXXVII.

Nephrodium multicaudatum, C. B. Clarke, from a Jaintea Terai example; stipe together with the lowest secondary pinna of the lowest primary pinna of the frond, nat. size.

PLATE LXXVIII.

Nephrolepis volubilis, J. Smith, from Hooker's Sylhet example.—A. Portion from the upper part of the scandent rhizome with barren fronds, nat. size. B. Fragment of a barren frond, from a lower part of the scandent rhizome, nat. size.

PLATE LXXIX.

Fig. 1. *Polypodium distans*, Don, var. *minor*, from a Sikkim example; a frond in fruit, nat. size.

Fig. 2. *Polypodium appendiculatum*, Bedd., var. *squamestipes*, from a Sikkim example; lower half of a frond, nat. size.

PLATE LXXX.

Fig. 1. *Polypodium subtripinnatum*, C. B. Clarke, from a Neebay (Sikkim) example; basal portion of one of the lower pinnae of the frond, nat. size.

Fig. 2. *Polypodium subdigitatum*, Blume, from a Sikkim example; ultimate pinna, magn. 5 diam.

PLATE LXXXI.

Polypodium chattagramicum, C. B. Clarke, from a Chittagong example; rhizome with one barren and one fertile frond, nat. size.

PLATE LXXXII.

Fig. 1. *Polypodium clathratum*, C. B. Clarke, from a Kashmir example.—A. Rhizome with three fronds, nat. size. B. Clathrate scale from the sorus, magn. 8 diam.

Fig. 2. *Polypodium subamanum*, C. B. Clarke, from a Sikkim example.—A. Rhizome with one frond, nat. size. B. Scale from the rhizome, magn. 8 diam.

Fig. 3. *Polypodium membranaceum*, Don, from a Sikkim example; fragment of a frond, nat. size (showing the venation and arrangement of the sori).

Fig. 4. *Polypodium Jaintense*, C. B. Clarke, from a Jaintea example; rhizome with one fertile and one barren frond, nat. size.

PLATE LXXXIV.

- Fig. 1. *Lycopodium lucidulum*, Michx., from a Sikkim example; fruiting branch, nat. size.
- Fig. 2. *Asrostichum crispatum*, Wall., from Sikkim examples.—B. Fragment from the middle of a barren frond of Wallich's type, 6 pinnae shown, nat. size. D. A part of one of the pinnae of B, magn. $1\frac{1}{2}$ diam. A. Fragment from the middle of a barren frond of var. *confusum* (sp. Wall.), 7 pinnae shown, nat. size. C. A part of one of the pinnae of A, magn. $1\frac{1}{2}$ diam.
- Fig. 3. *Vittaria Sikkimensis*, Kuhn, from a Sikkim example; transverse section of a fruiting frond, magn. 10 diam.

ERRORS.

On page 444, line 18 from top, *dele* "*Cystopteris dimidiata*, Dene."; which is correctly referred to *D. BULLATA* on . 445.

On page 512, bottom line, *for* "*F. cuspidatum*" *read* *N.*

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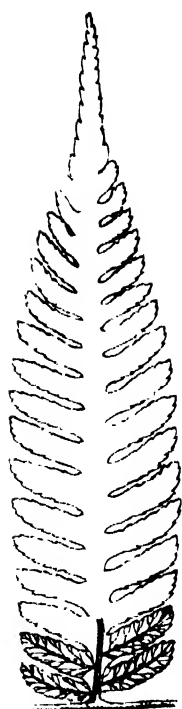
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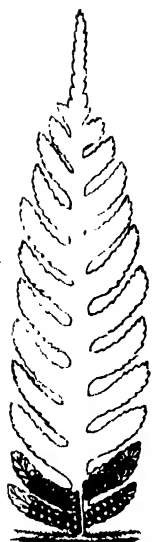
3.

4.



Fern. pennula
A

Fig 1



Fertile pinnule
B

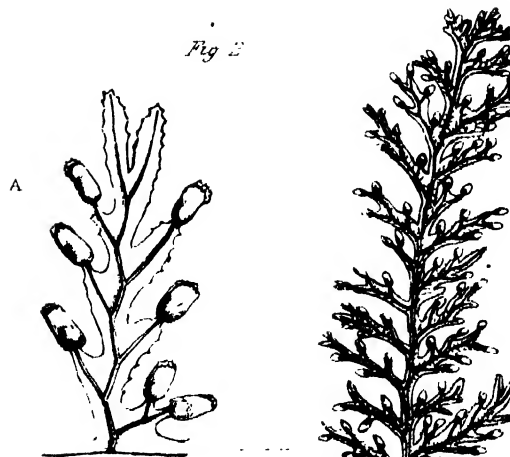
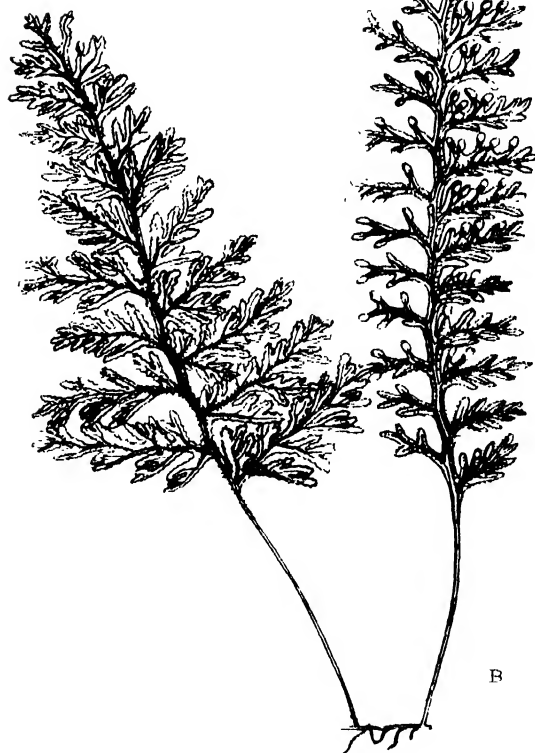


Fig 2



B



C

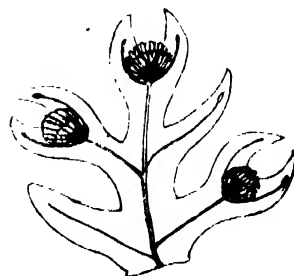
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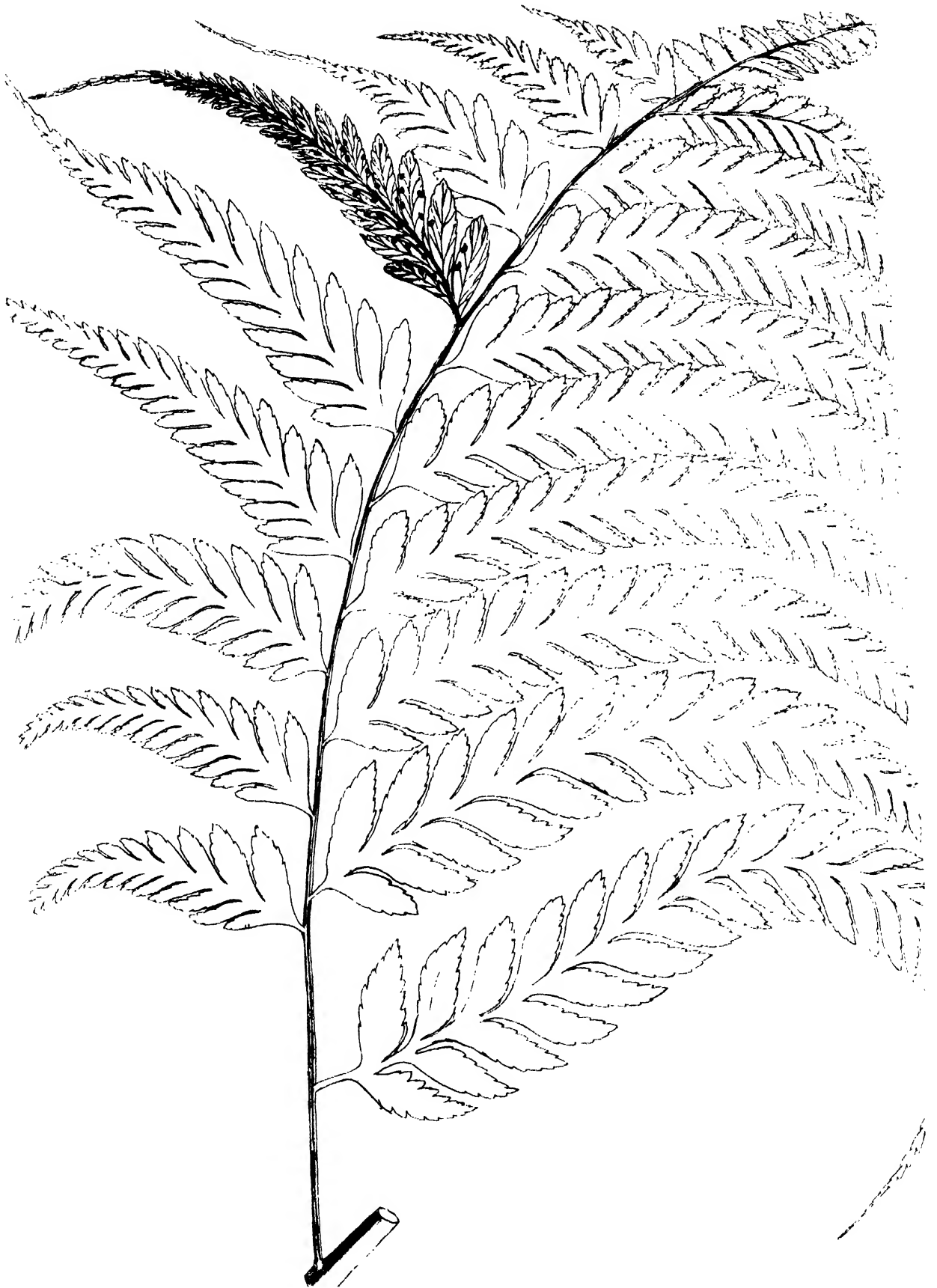
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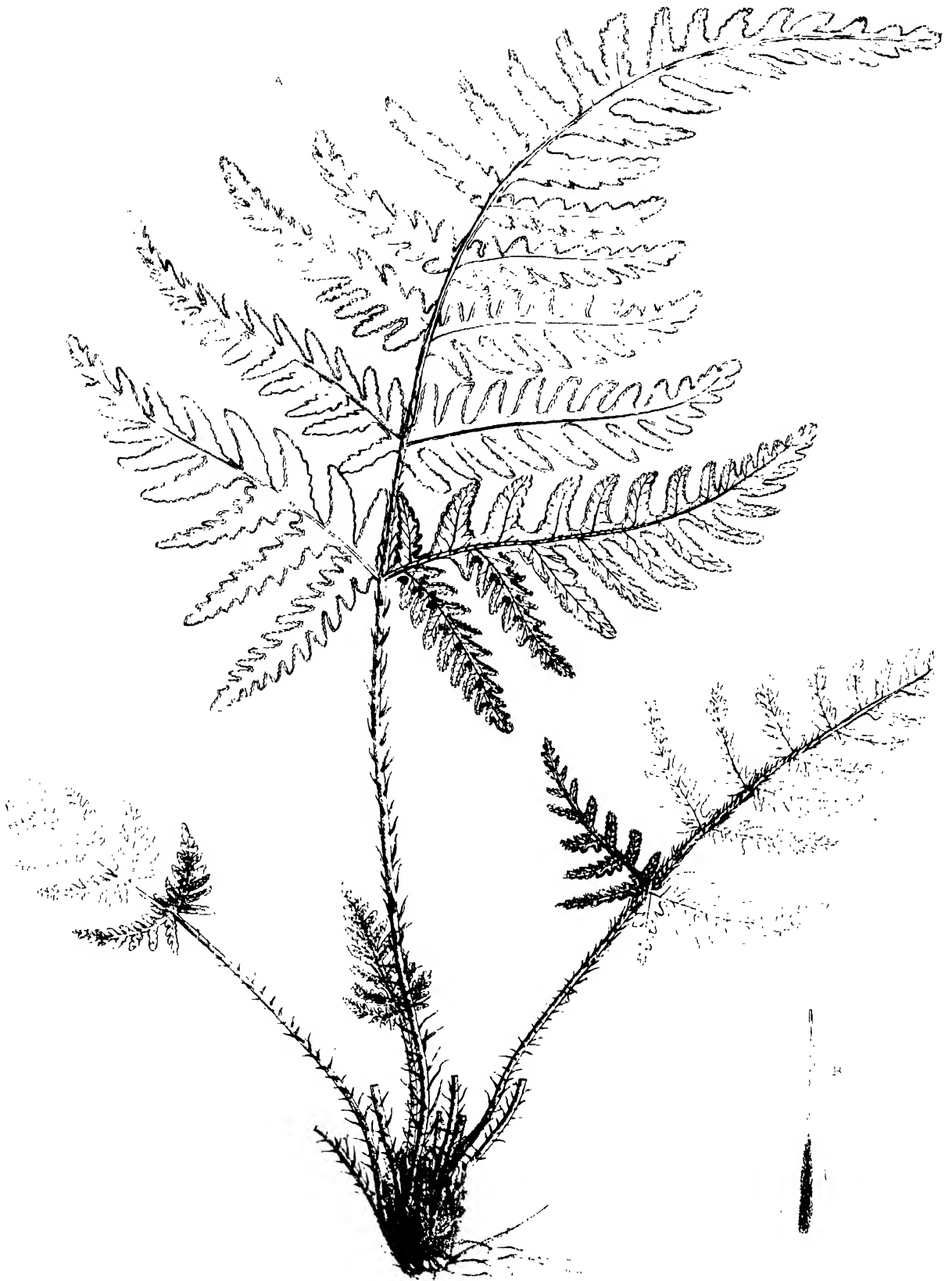
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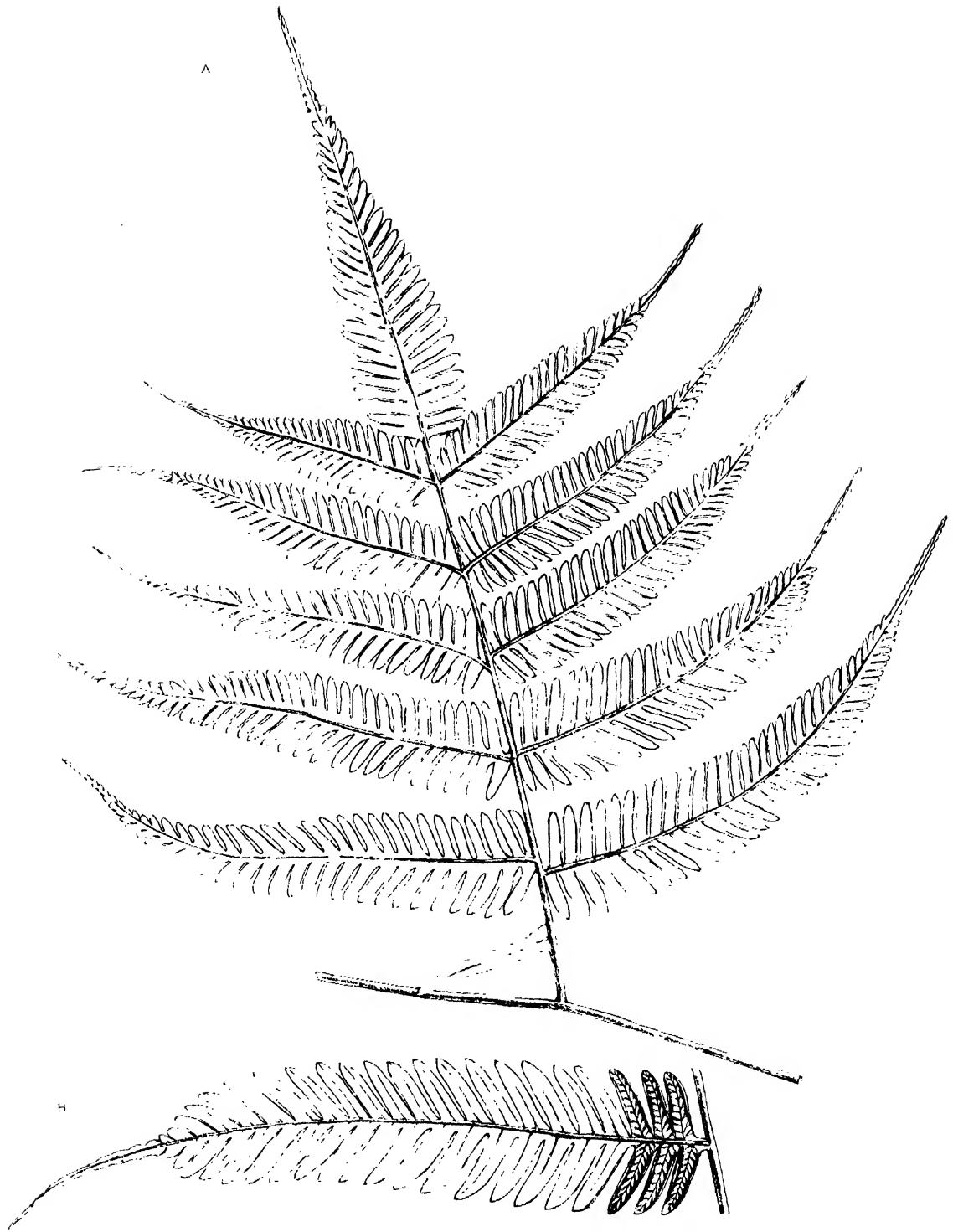
C.B. Clarke.



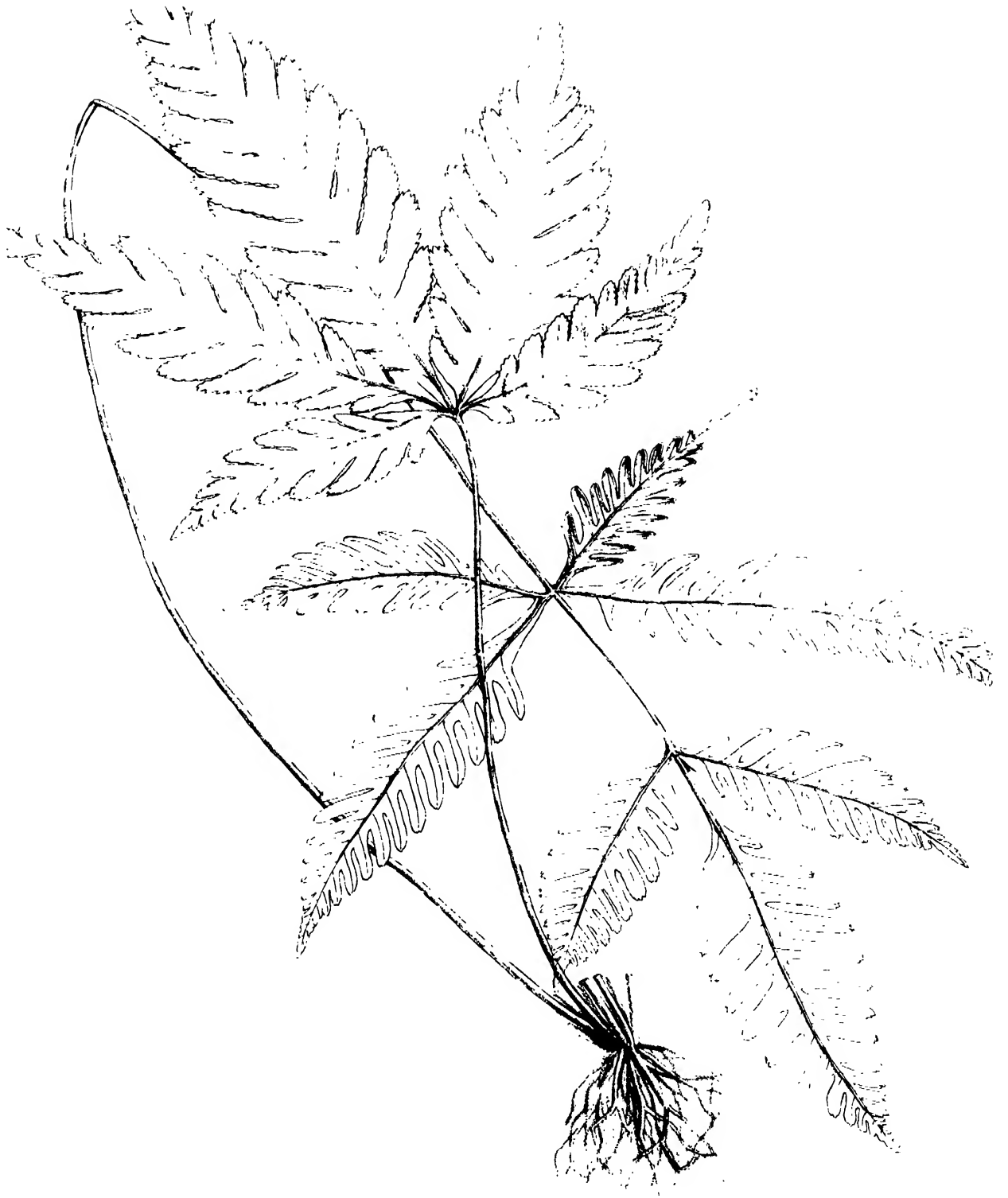




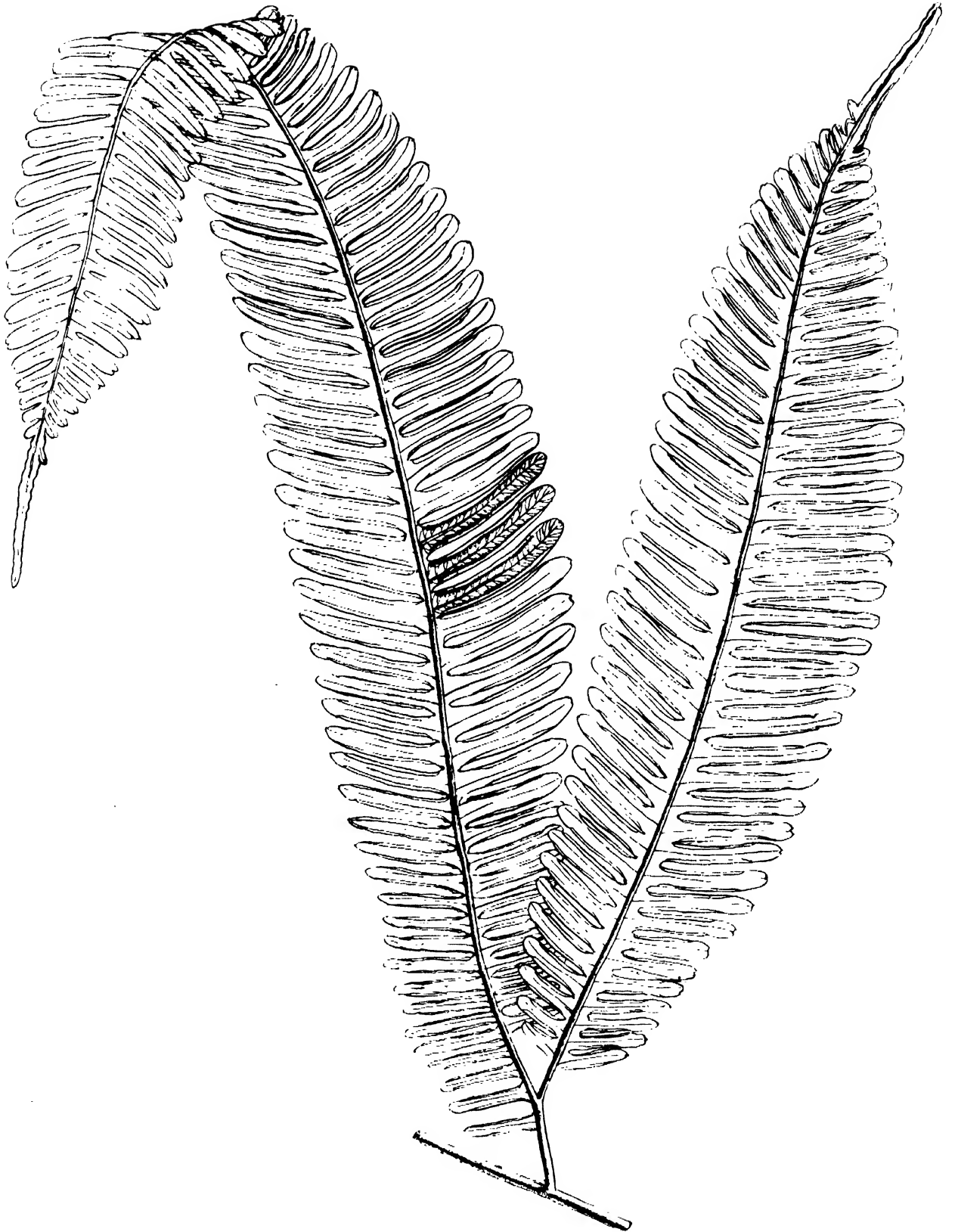
CHEILANTHES ALBO-MARGINATA. *Ch. Clarke*



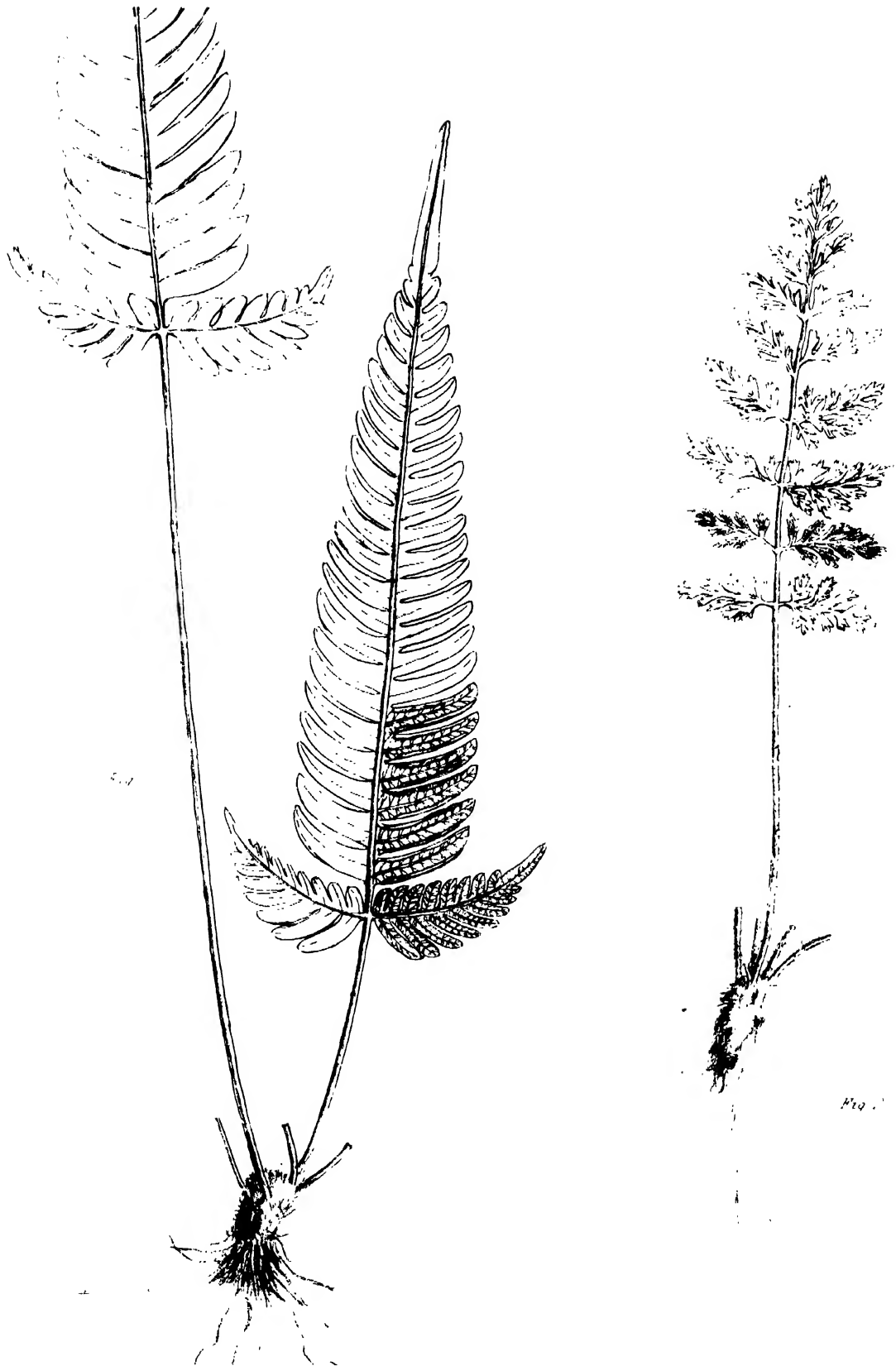
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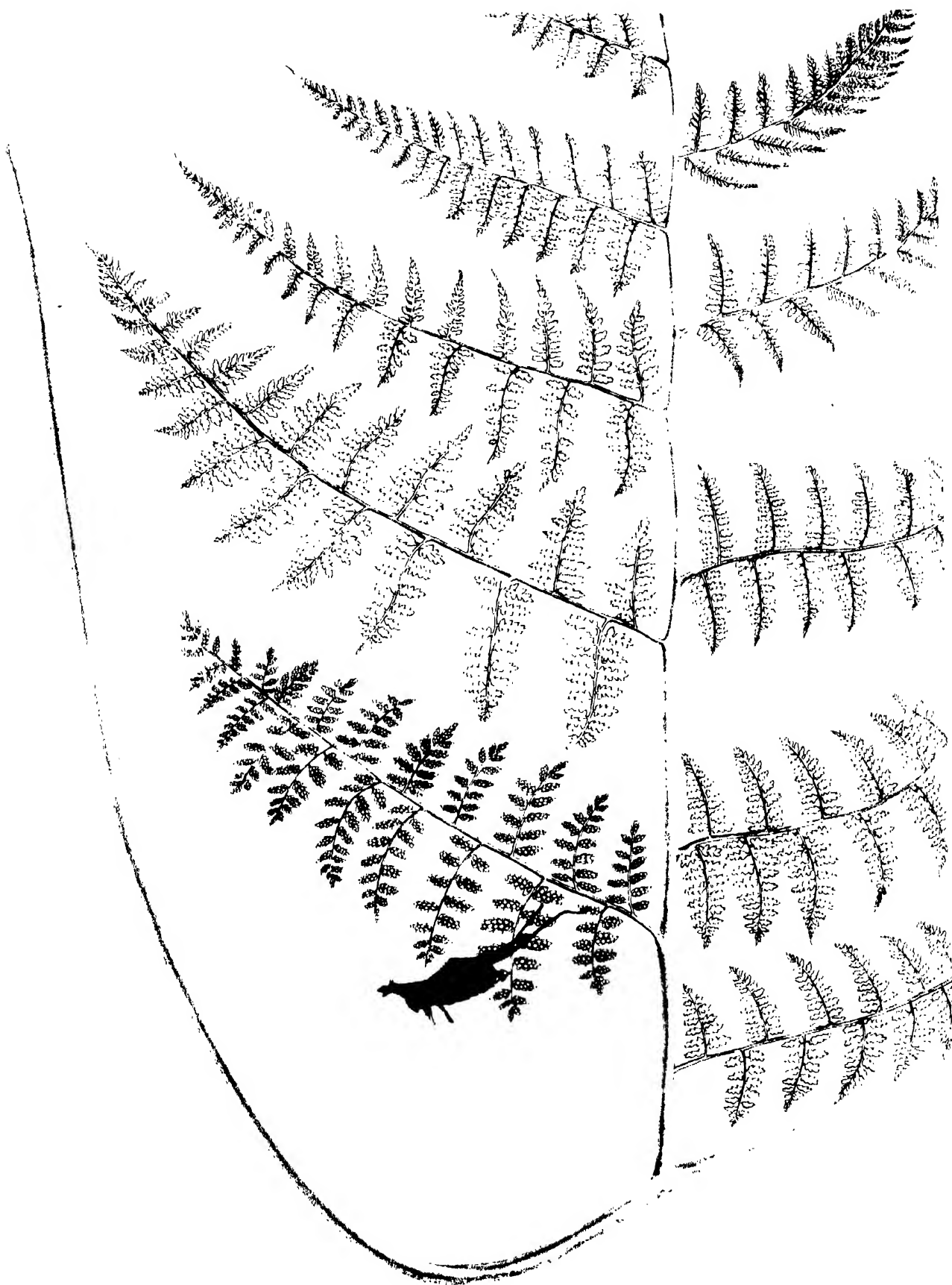
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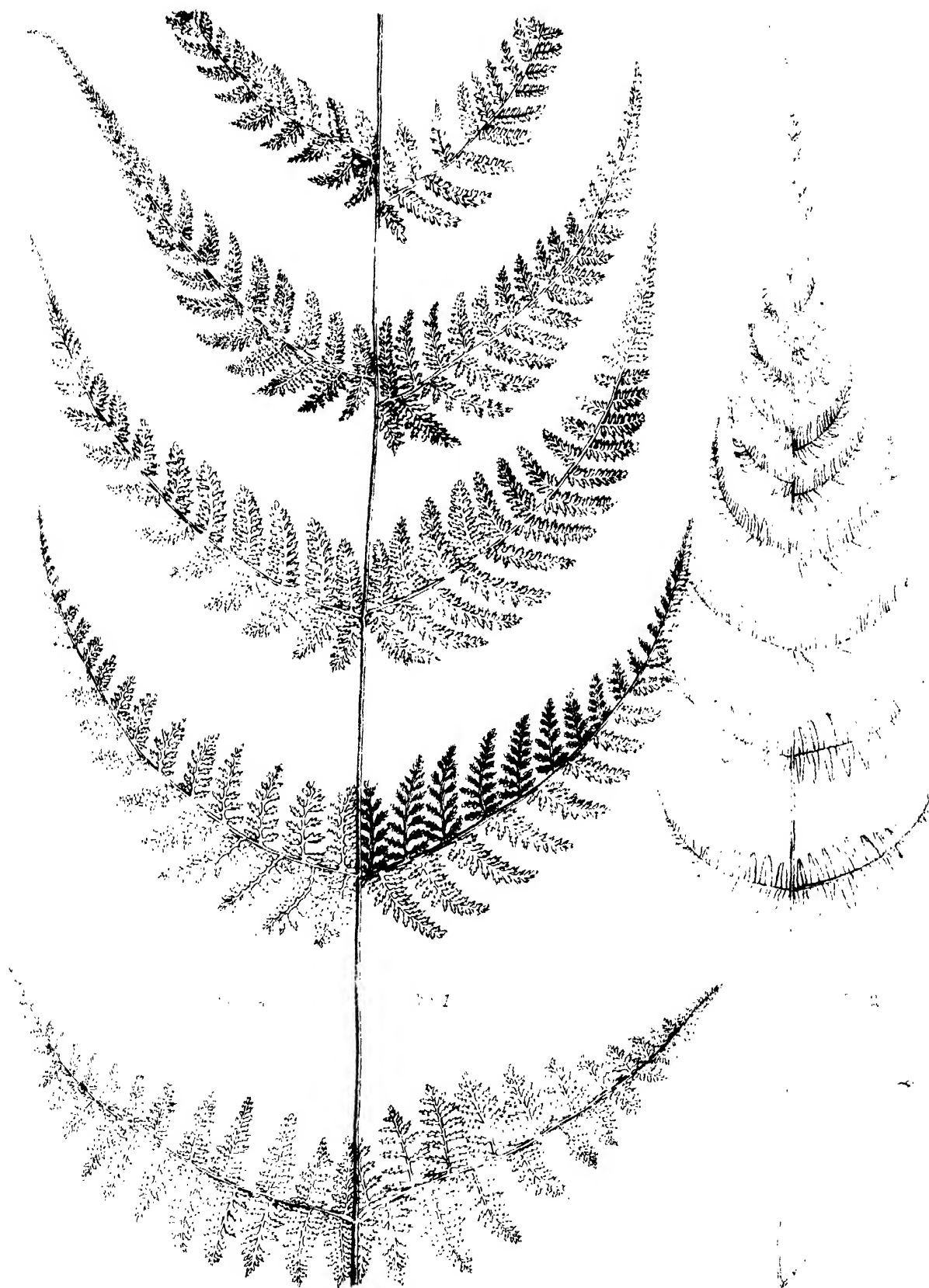
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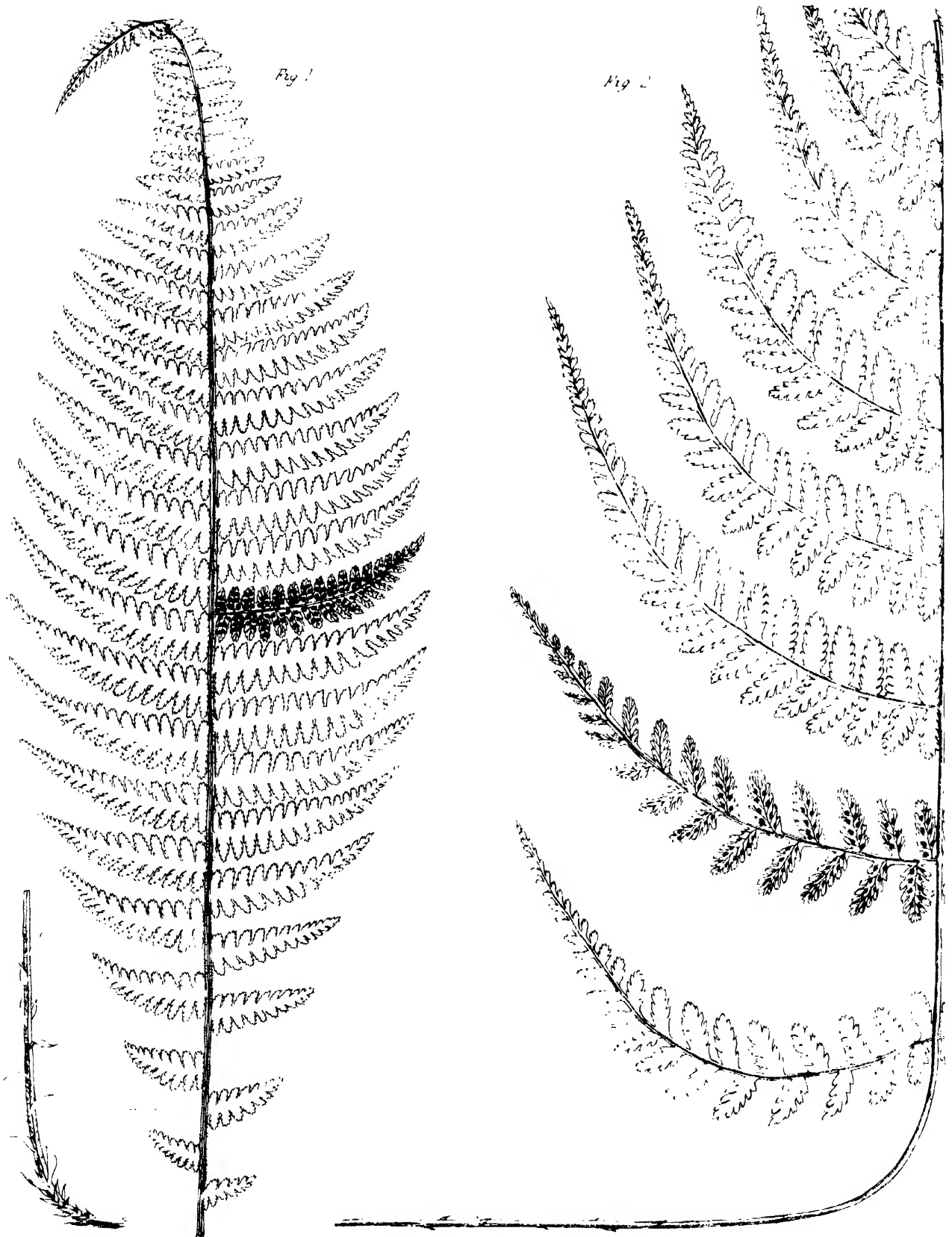
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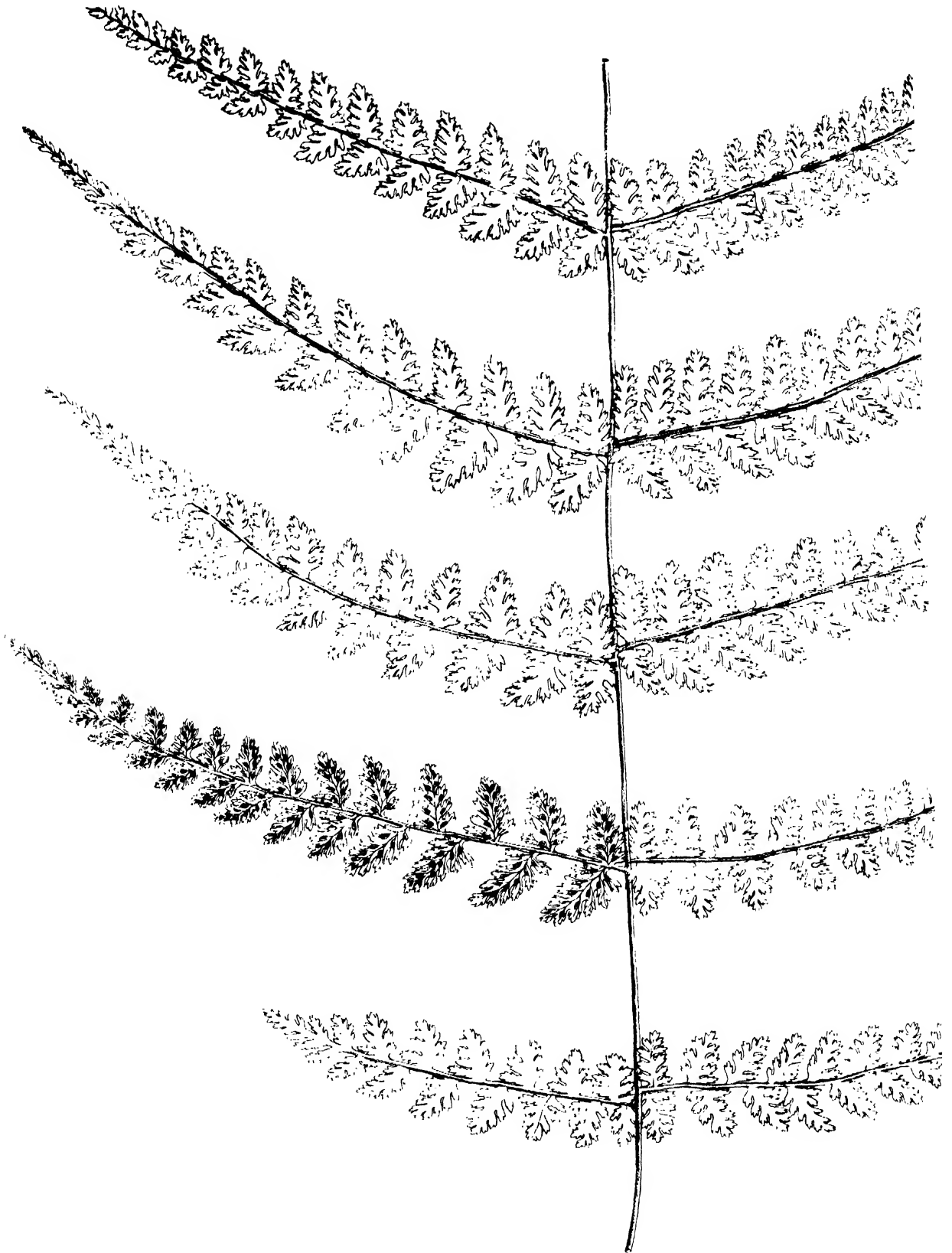


ASPLENIUM FILIX FEMINA. *Ferné* var. PECTINATA



1 ASPLENIUM FILIX FEMINA, Bernh. Var. ATTENUATA, C.B. Clarke

C.B. Clarke.



9. M. Cockerill del. et lith. ASPLENIUM FILIX FEMINA, *Berni* var. FLABELLULATA, C.B. Clarke

H Clarke

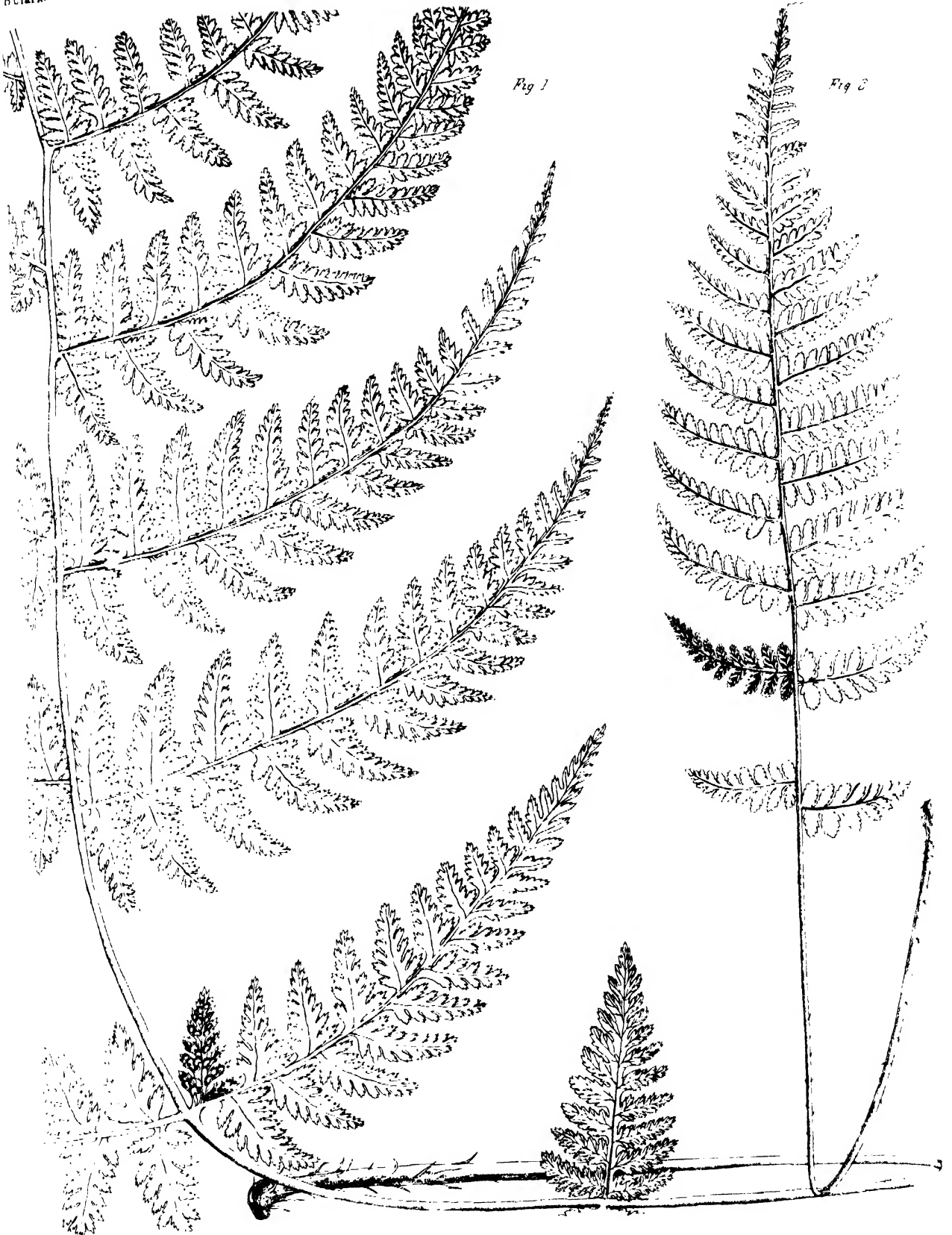
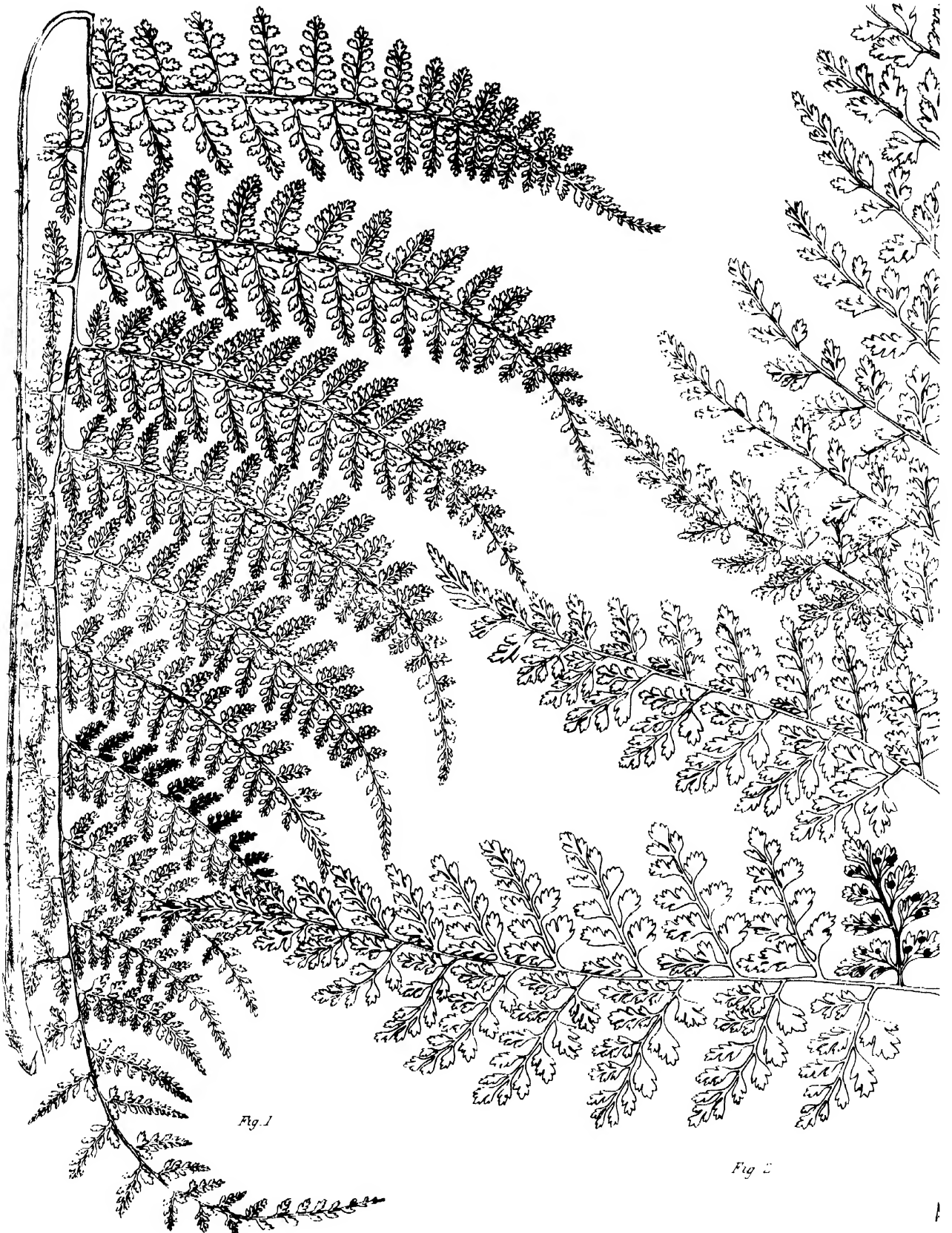


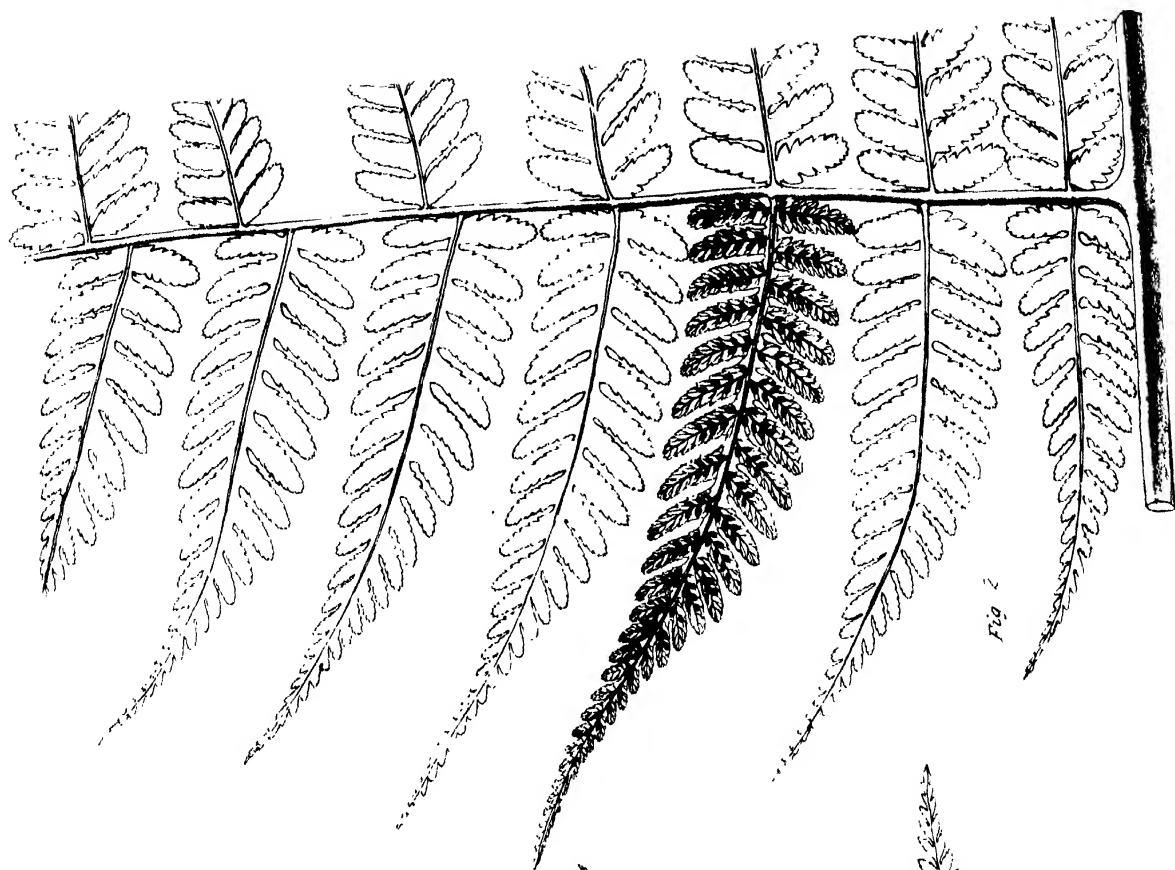
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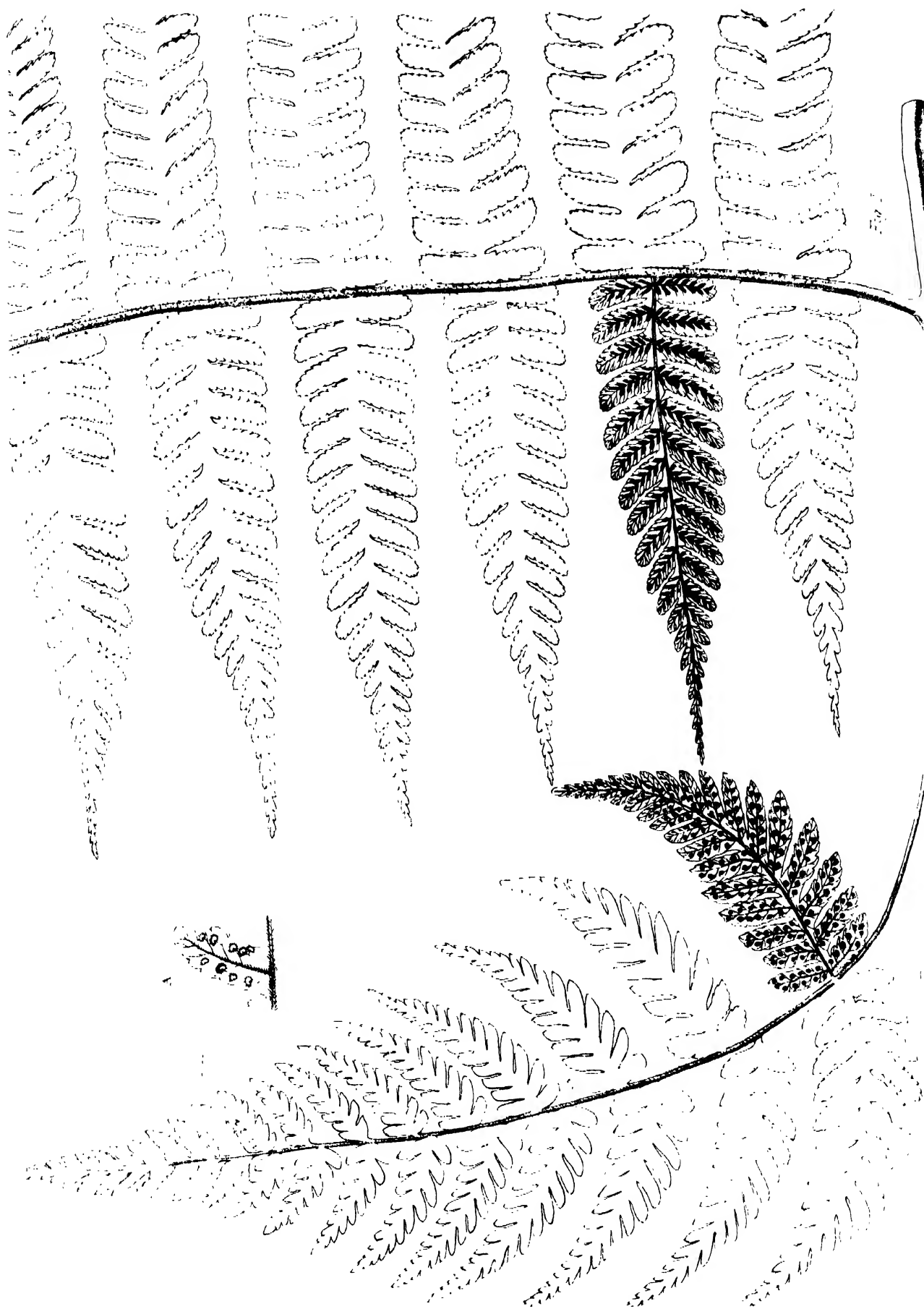
Fig 2

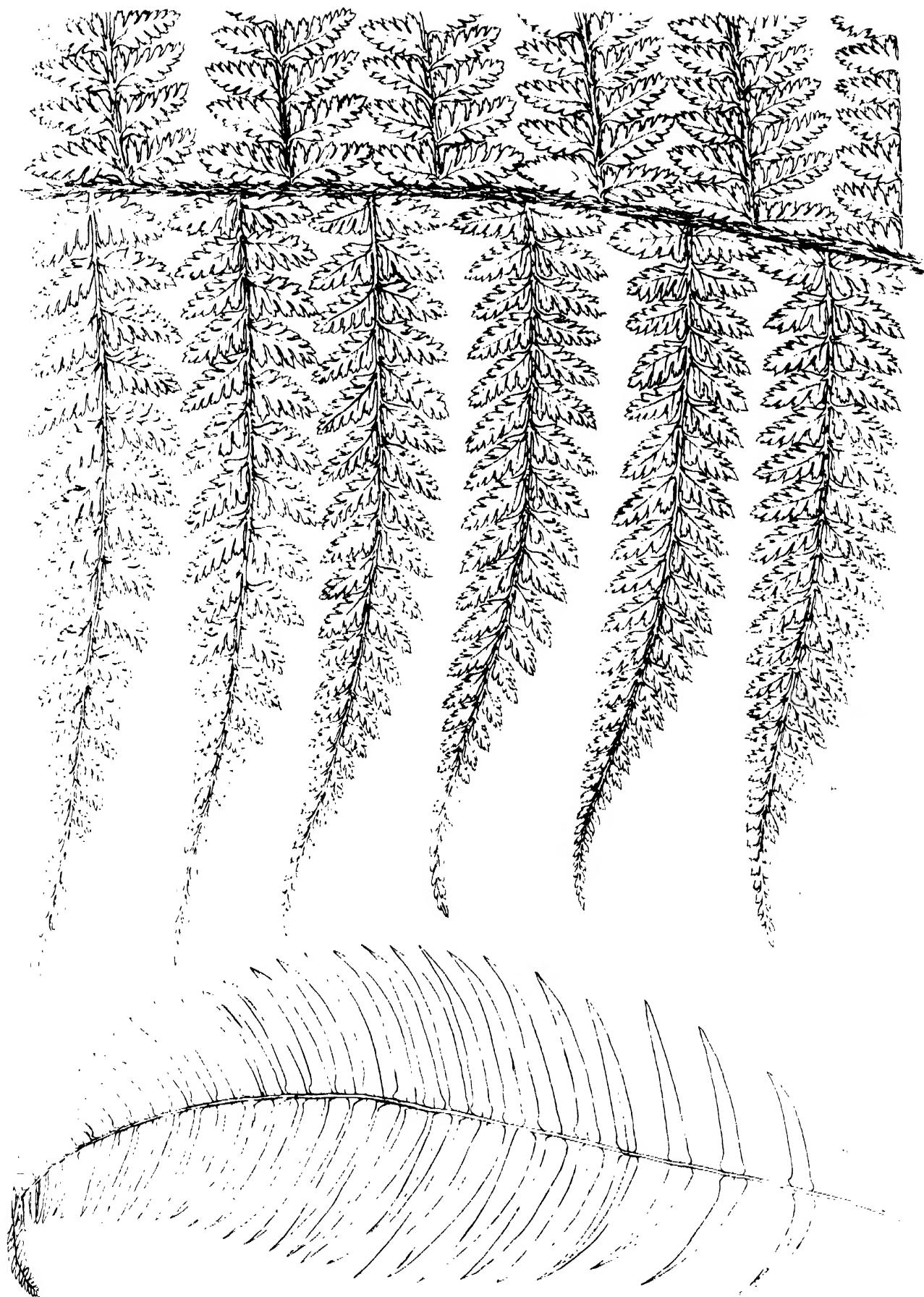
1 ASPLENIUM FILIX-FEMINA, Bernh. Var. POLYSPORA, C.B. Clarke
Bernh. Var. PARAGNATHENSIS, C.B. Clarke



ASPLENIUM FIMBRIATUM, Hook Var SPHÆROPTEROIDES
 " " Hook Var FOLIOLOSA, (Sp) Wall







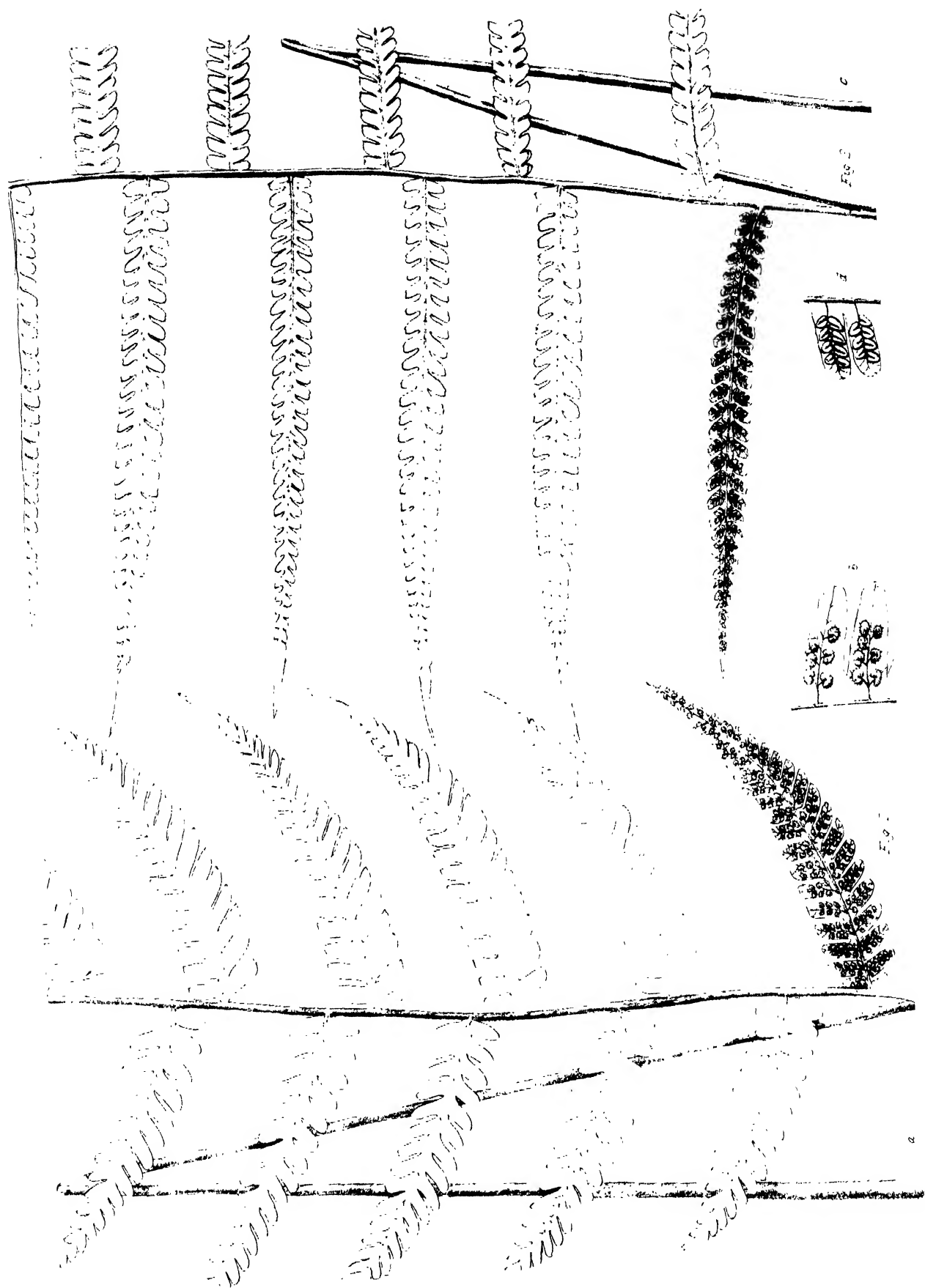




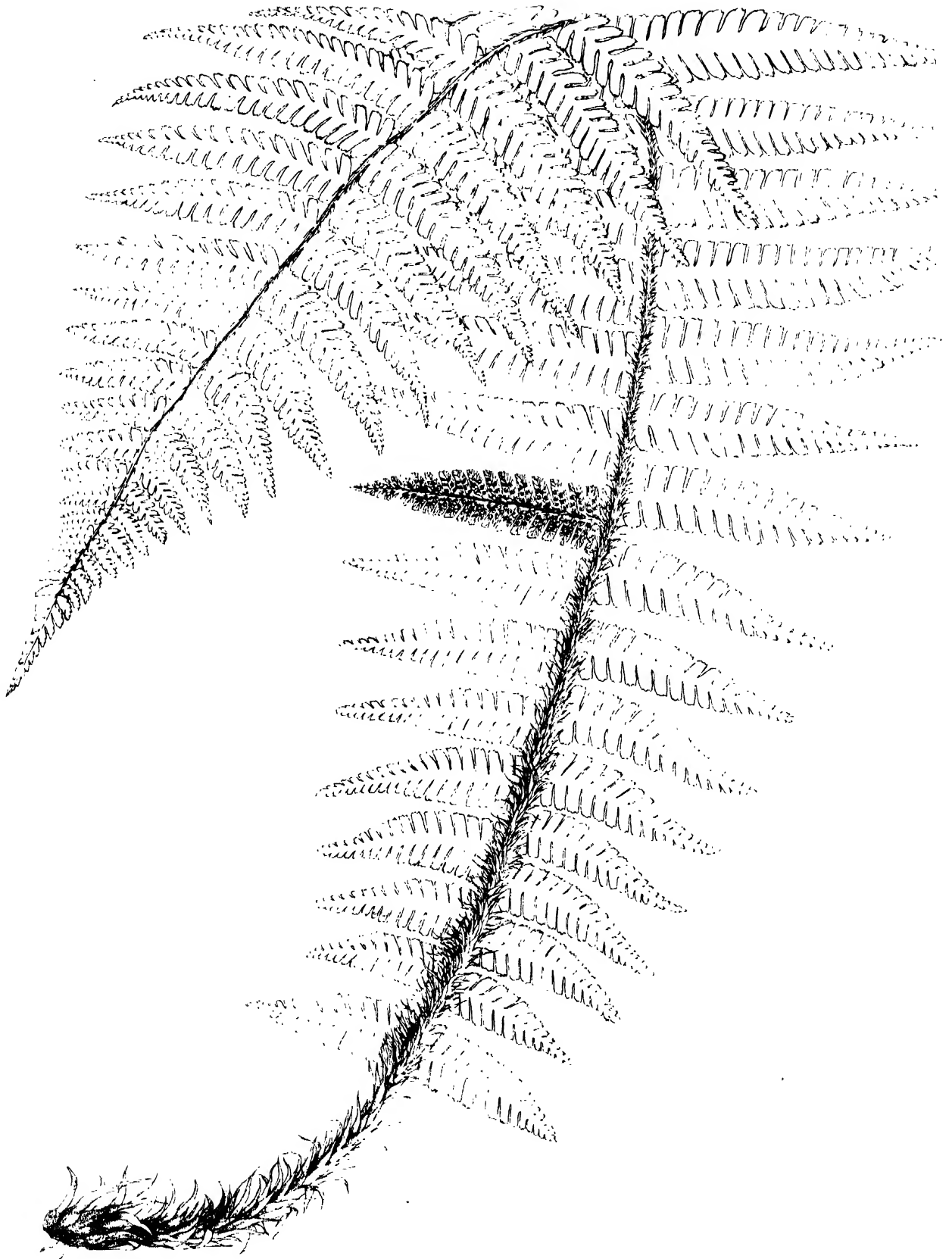
Fig. 1

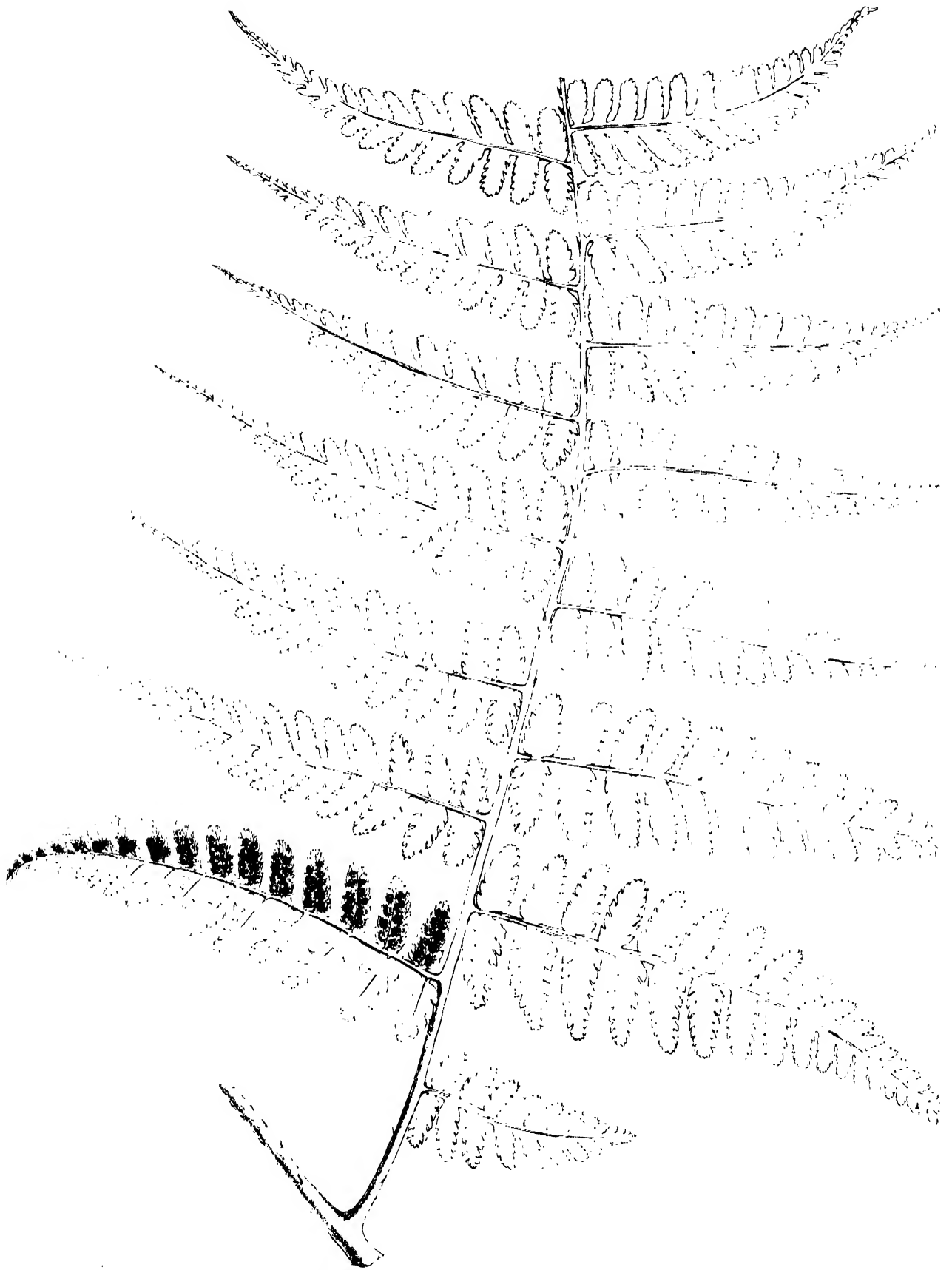
Fig. 2

1 NEPHRODIUM FILIX MAS *Kuhn* Var. PANDA
Var. NORMALIS

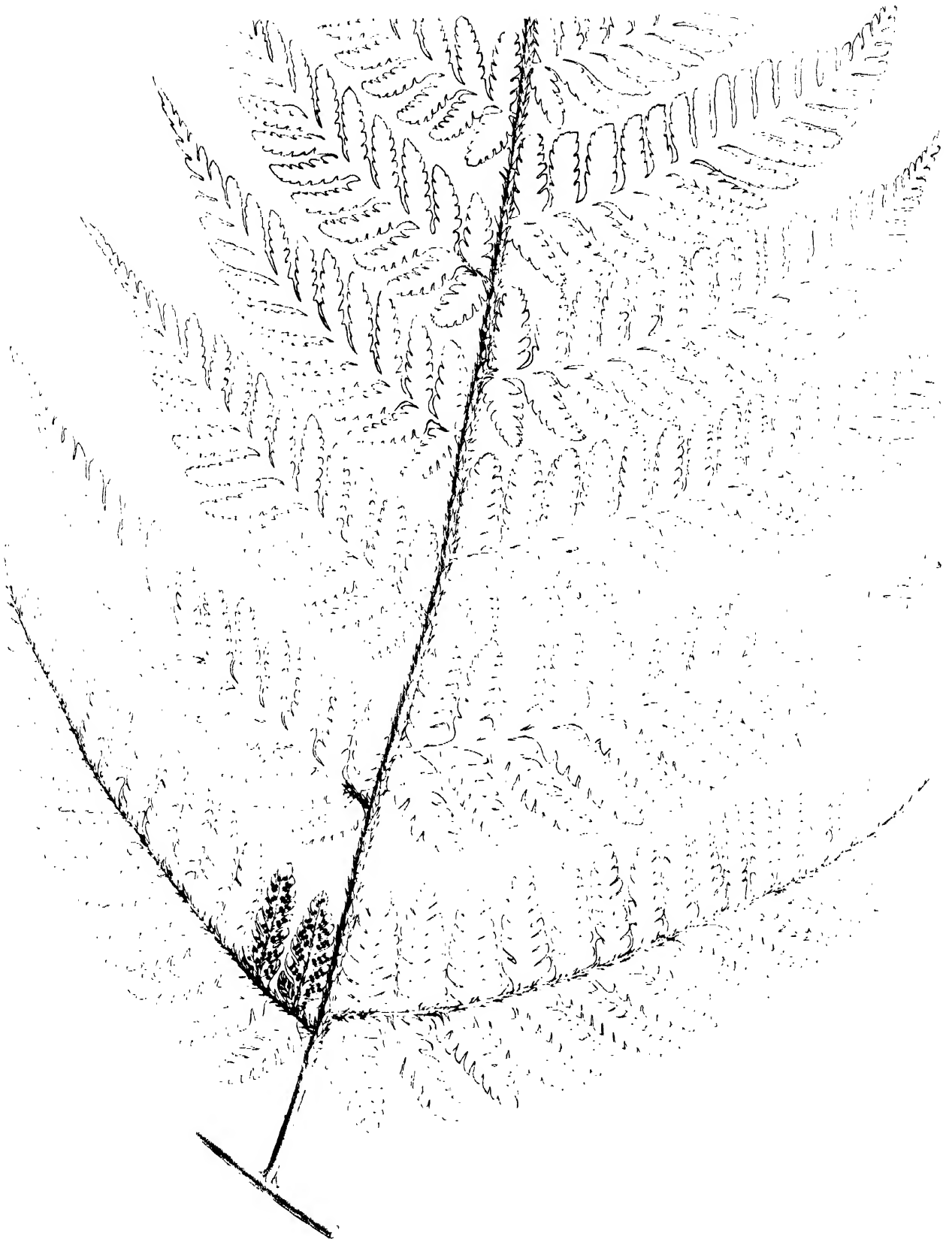


Fig 2

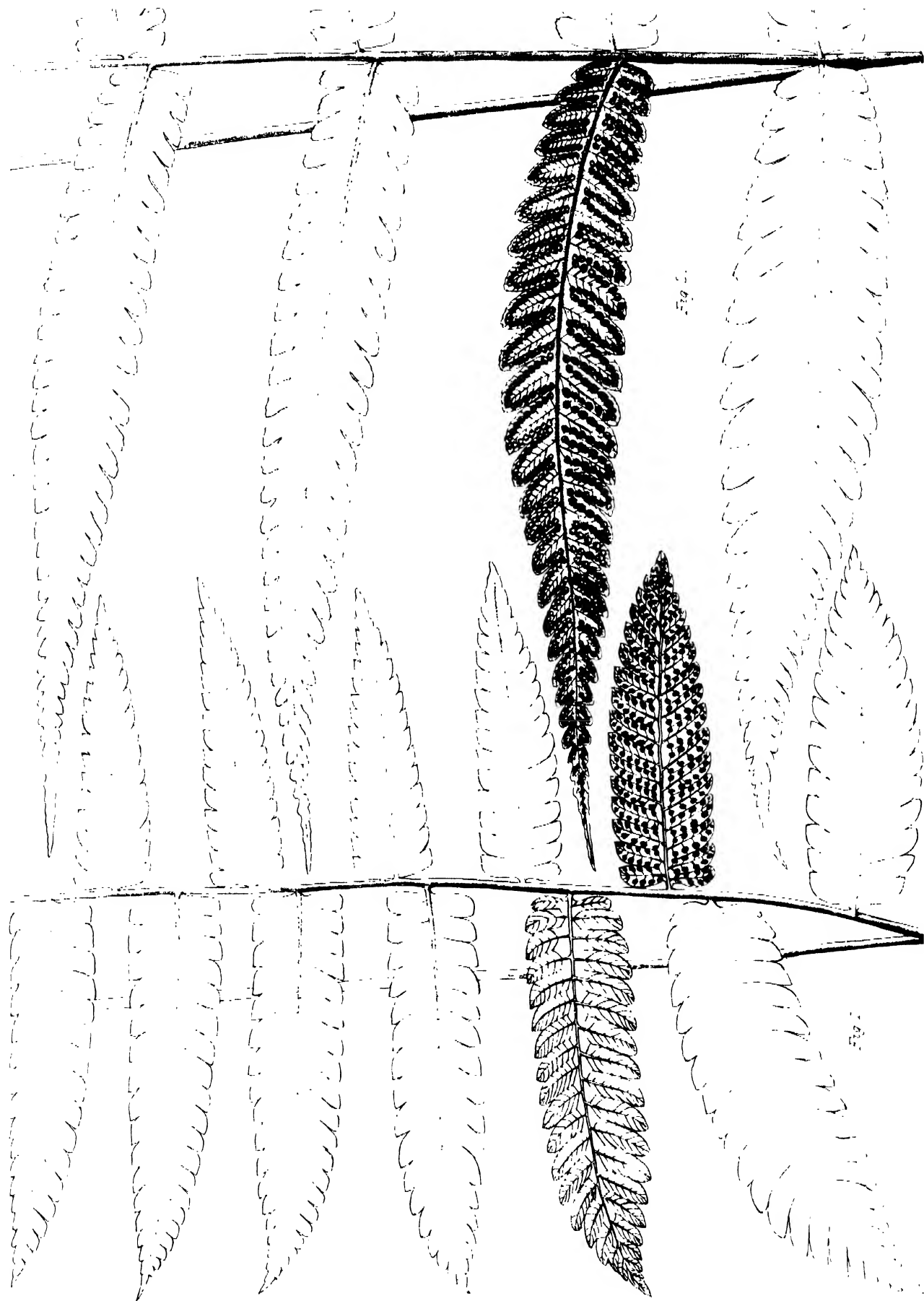




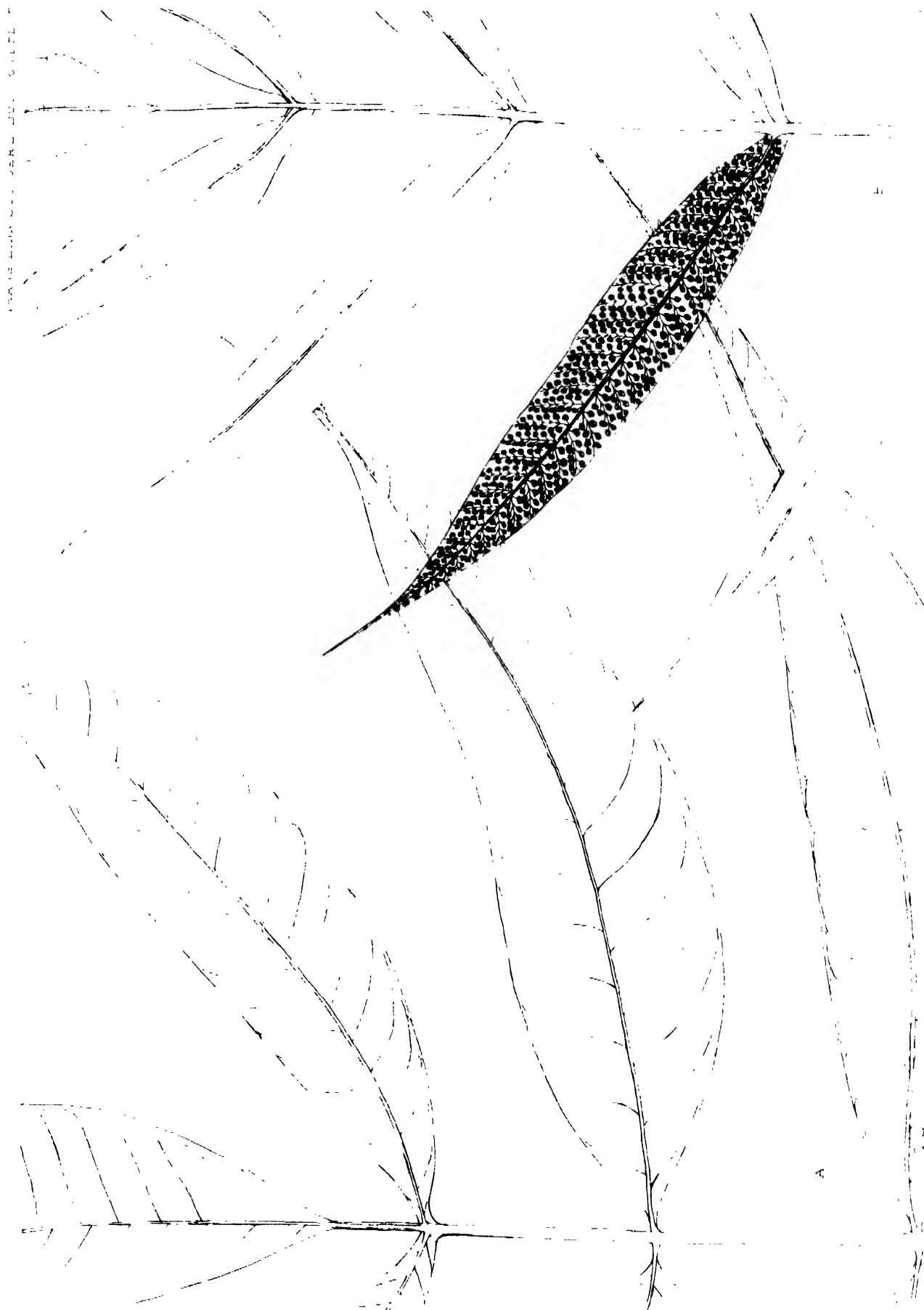
NEPHRODIUM FILIX-MAS, *Richd* Var MARGINATA, (*Sp*) *Wulf*

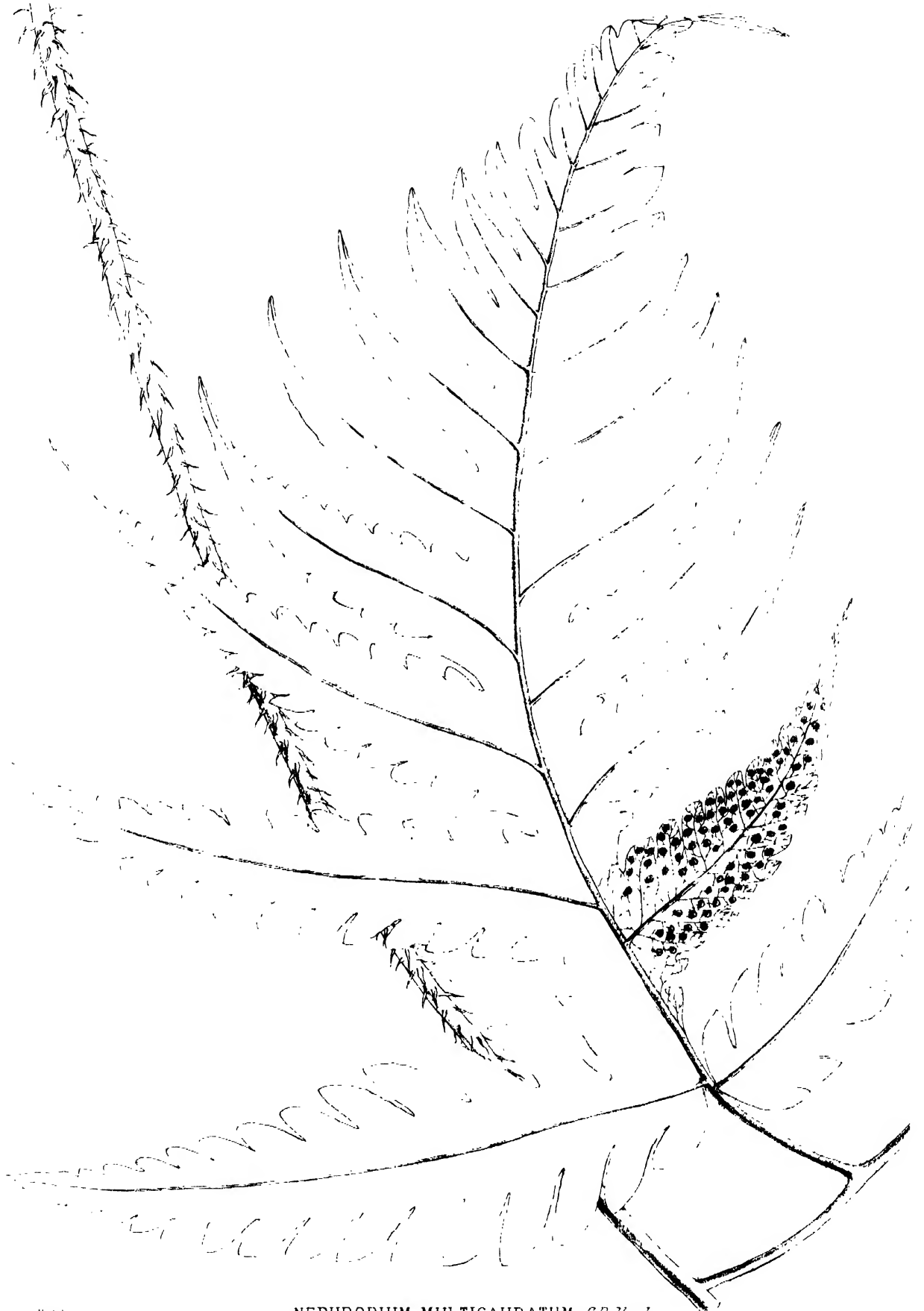


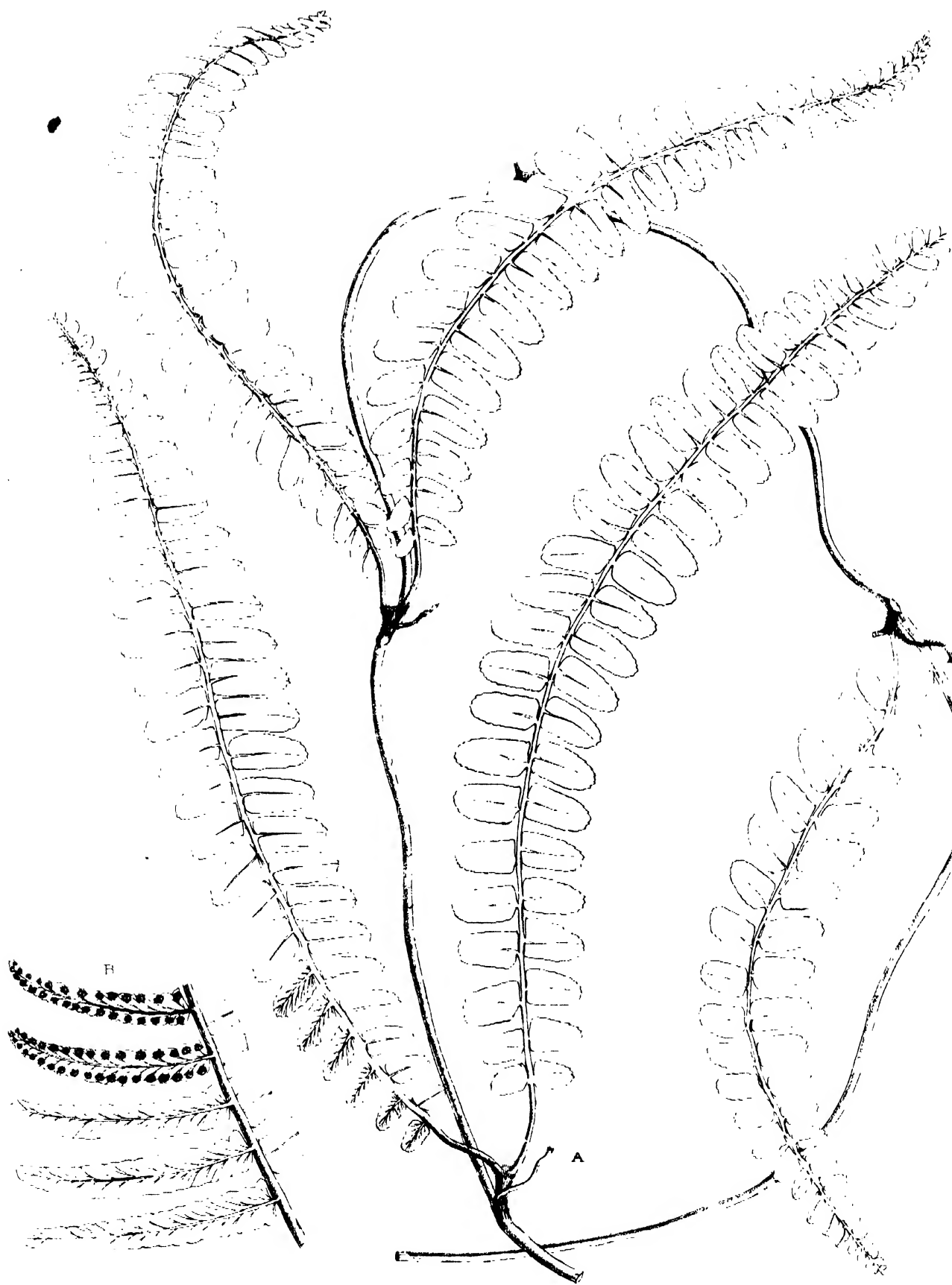
EUPEDIUM RHODOLEPIS, *H. Clarke*

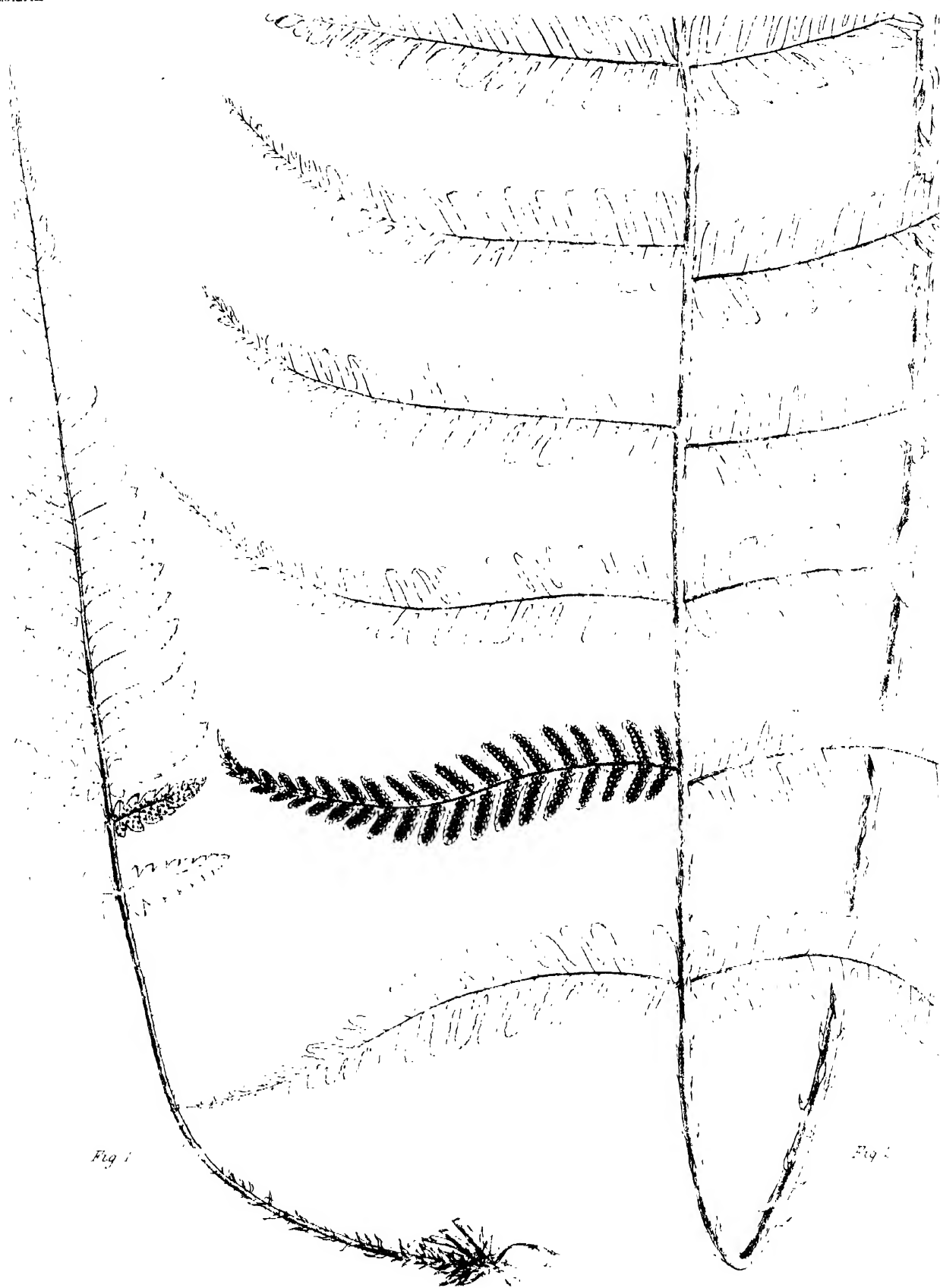












L. POLYPODIUM DISTANS, Don
APPENDICULATUM, Boed. var. SQUAMÆSTIPES

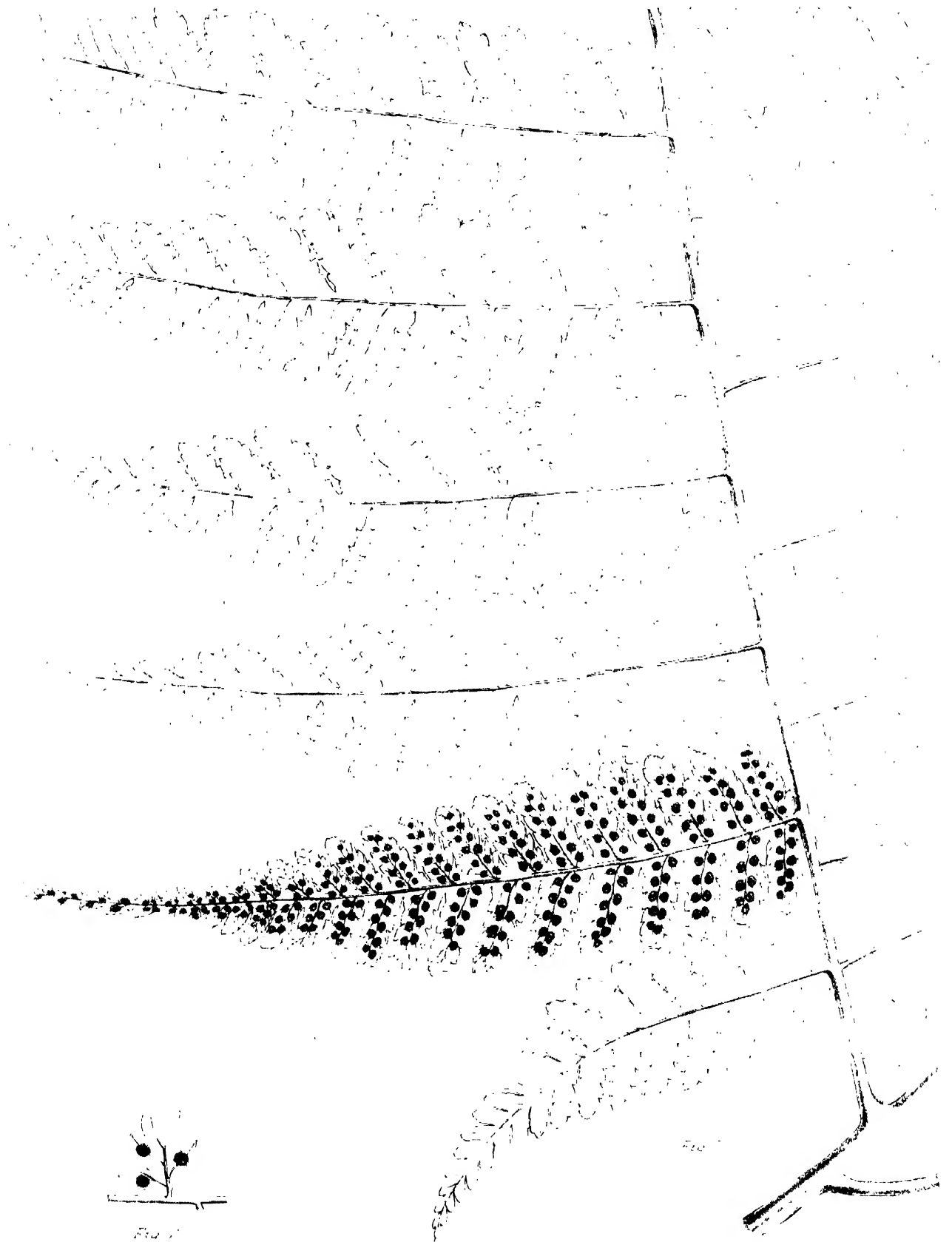
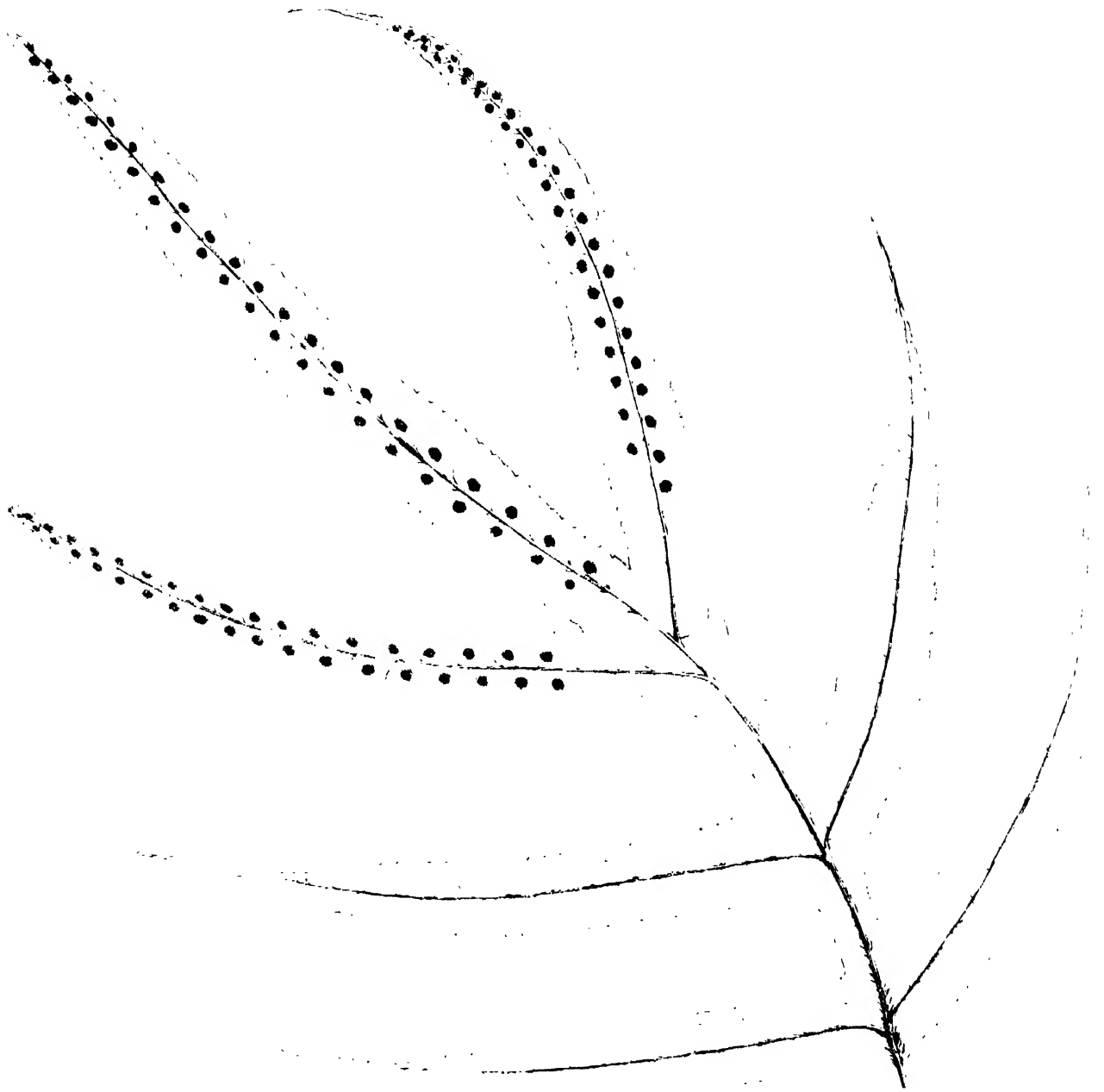


Fig. 1

Fig. 2

1 POLYPODIUM SUBDIGITATUM, *McClarke*
SUBDIGITATUM *Clarke*



DIAPYCNIS CYRTLOBUM *Thunberg*



Fig. 3



Fig. 4

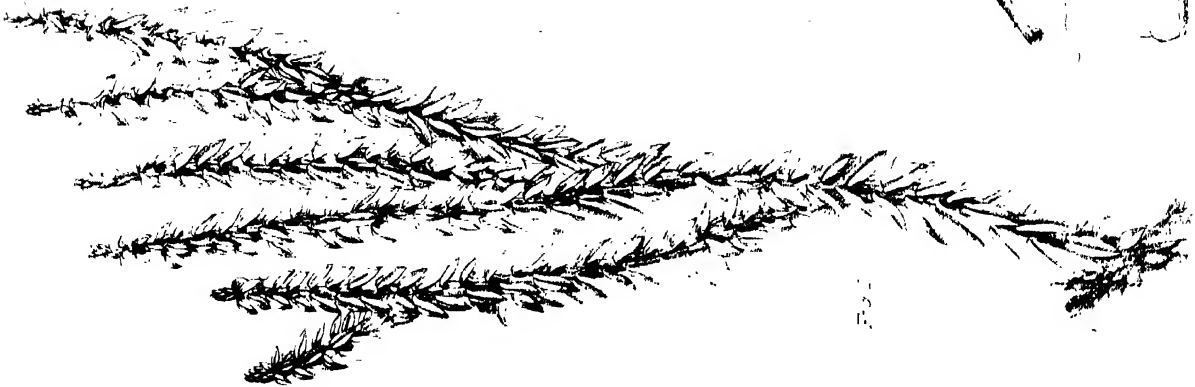
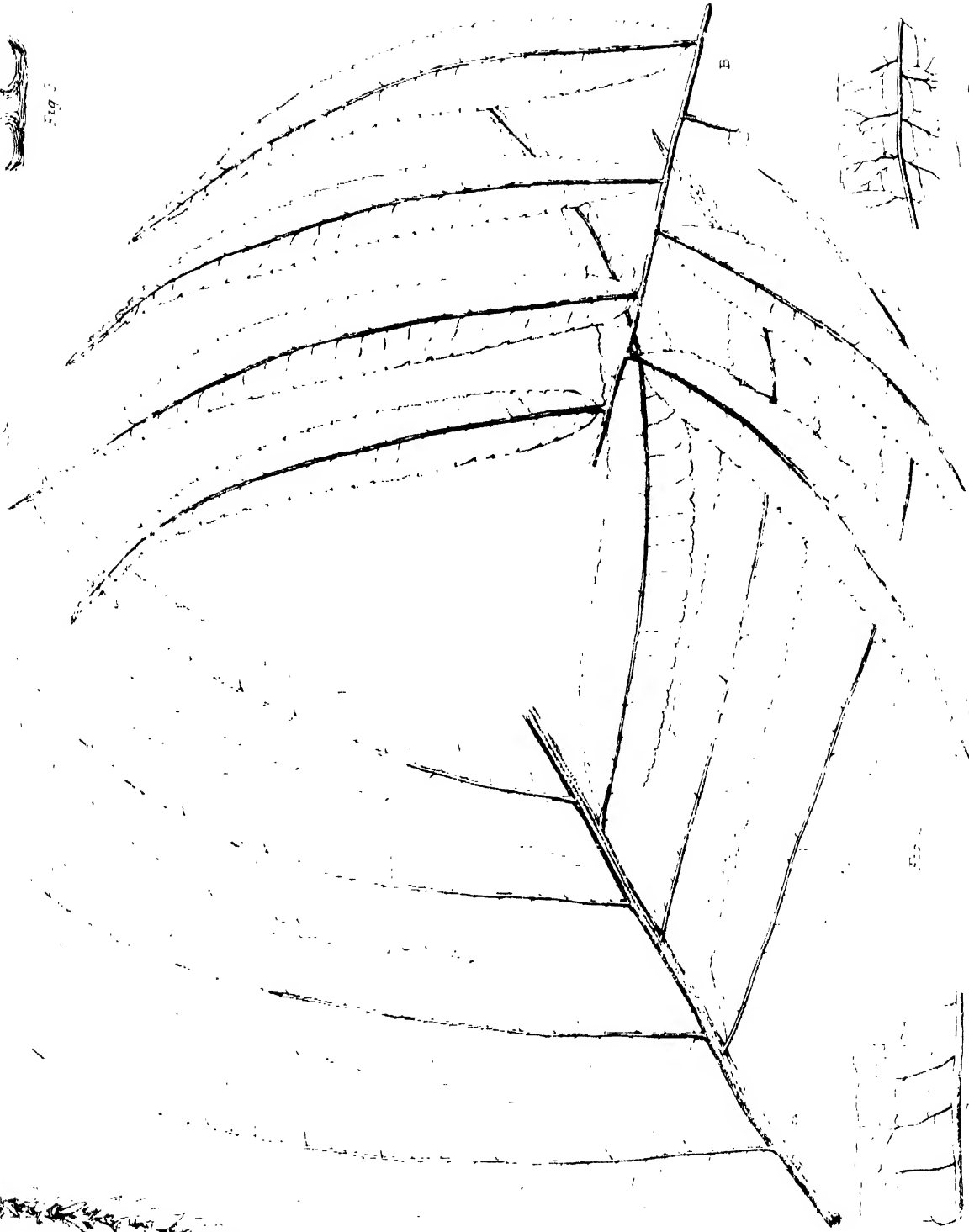


Fig. 6

